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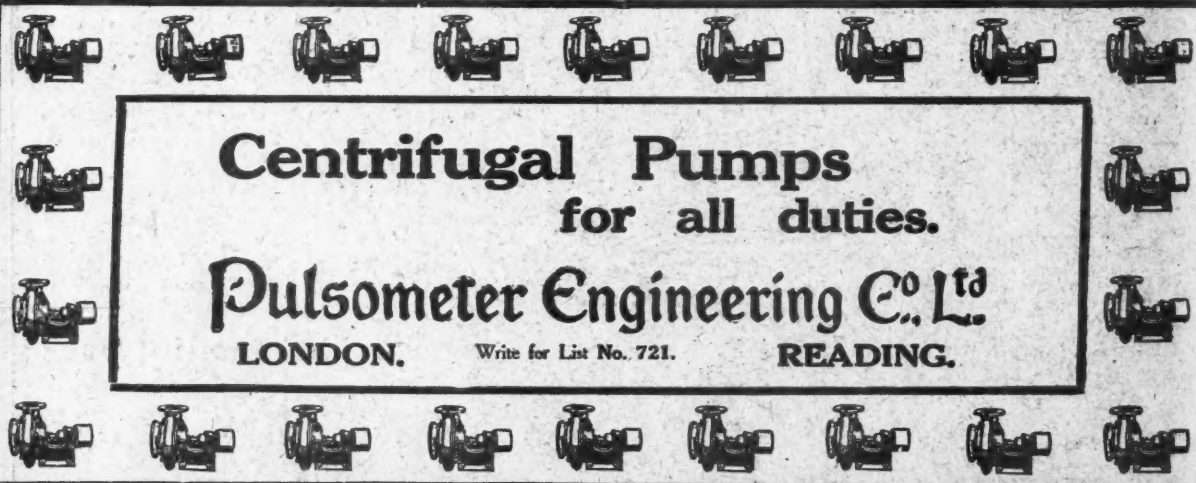

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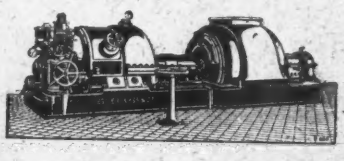

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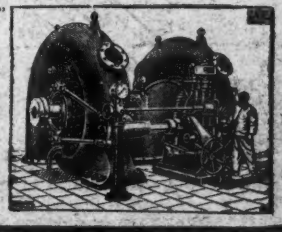

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THE

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Vol. LXXVIII.] CONTENTS: February 11, 1916. [No. 1,994.

	Page
British Industry after the War	161
Rubber	162
The Eastbourne Switch-pillar Fatality	162
German Electrical Companies after the War	163
British Trade after the War	163
Municipal Electricity Supply at Johannesburg, by R. T. Mawdesley (*illus.*) (*concluded*)	165
Notes from Canada	166
New Electrical Devices, Fittings and Plant (*illus.*)	167
Protection from X-Rays	167
The Eastbourne Fatality	168
The Design of High-Pressure Distribution Systems	168
War Items	169
Legal	170
Business Notes	171
Notes	176
Reviews	179
City Notes	180
Stocks and Shares	181
Electric Tramway and Railway Traffic Returns	182
Share List of Electrical Companies	182
Notes on Electric Welding Practice (*illus.*) (*continued*)	183
Modern Printing Telegraphy	184
The "Machinery Age" in Farming (*illus.*)	185
Correspondence—	
Electric Iron Connections	187
The I.E.E. and Alien Enemy Members	187
Foreign and Colonial Tariffs on Electrical Goods	188
New Patents Applied for, 1916	188
Abstracts of Published Specifications	188
Contractors' Column	Advertisement page xx

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IN view of the recent Increase in the Postal Charges, our Subscription Rates for Great Britain and Canada will until further notice be increased to £1 1s. 8d. and £1 3s. 10d. respectively.

BRITISH INDUSTRY AFTER THE WAR.

WHAT is to be the outcome of the exhaustive investigation that has been made by a sub-committee of the Advisory Committee to the Board of Trade on Commercial Intelligence? We wish that we could expect more than we really do by way of immediate result. The findings of the sub-committee as adopted by the committee have been published—for our information. That is all that Mr. Runciman will or can say at the moment. The sub-committee was a small one (five members), and it only had to consider a few selected industries. These circumstances unfortunately open the way for delay, and that way the President and his Department elect to follow. Why? In the House of Commons a few weeks ago the President said that many of the recommendations were of wider scope than the group of industries investigated, and that "any decision thereon must involve considerations of policy affecting many other industries and interests." Mr. Runciman declined to take "responsibility for any of its conclusions," but he felt, nevertheless that, "pending the institution of wider inquiries," it was desirable "for the public to be made acquainted with the information so far obtained." How much better than a cold douche is this? Yet we cannot entirely blame the President for this attitude, for the committee itself says that "the conclusions at which we have arrived might be modified in some respects were the range of the inquiry to be extended." We find herein little encouragement to seriously accept Mr. Runciman's very confident declaration that when the war is over we shall have available means for effectively dealing with German industrial and trading competition, and preventing the enemy from ever again "lifting her head" commercially, but as the report is in many ways important we feel justified in devoting a good deal of space to the matter. We hope that the Government will hasten the holding of those "wider inquiries."

The sub-committee was appointed six months ago to report what steps should be taken to secure the position, after the war, of firms who have undertaken industries "in consequence of the Exchange meetings leading up to the British Industries Fair." This, in the opinion of the committee, restricted its inquiry to the following:—(1) Paper manufacture. (2) Printing trade. (3) Stationery trade. (4) Jewellers' and silversmiths' trade. (5) Cutlery. (6) Fancy leather. (7) Glassware. (8) China and earthenware. (9) Toys. (10) Electrical apparatus. (11) Brushes. (12) Hardware. And a subsequent one, introduced by the President himself (13) Magneto industry. As regards (12), as the Wholesale Hardware Club could not furnish evidence within the time allowed, that branch is not covered. If it had been we should have had the unlucky number, and the President's cold douche might have been a foregone conclusion instead of, as we regard it, an extremely unpleasant surprise. Many of the above classes of industry are really no concern of ours as an electrical trade

journal, but we must indicate them so that nobody imagines that this is an electrical report pure and simple. We may desire to know what definition the committee would give for "electrical apparatus." In this connection we have to turn to the Cheapside Exchange meeting, where all sorts of "small stuff," of which we have imported large quantities from Germany, etc., was brought together, and to the British Industries Fair, at the Agricultural Hall, where, speaking from memory, we did not see much of an electrical character. But though this report is not one on electrical trade pure and simple, we may derive satisfaction from the circumstance that the committee availed itself somewhat generously of the information and counsel vouchsafed by the British Electrical and Allied Manufacturers' Association, and we find that in several places "electrical machinery" is referred to, which seems hardly to have been intended by the instruction to cover "electrical apparatus." We remember that the secretary of the B.E.A.M.A. not long ago told us, in pretty much the same words as Mr. Runciman used in his bravest speech in the House of Commons, that when the war was finished everything would be found in readiness. The B.E.A.M.A. certainly seems to have tried hard to impress a number of wholesome truths upon the minds of the committee; indeed, we believe it has succeeded, but then there is sometimes a difference between the minds of business men and those of our politicians. Something must now be done to prevent the Association's efforts, and those of the committee, being filed away and forgotten. We may hope for much from the Mansion House, the Sheffield, and other important demonstrations intended to impress the Government with the necessity for strong and forceful action before it is again "too late"; we may look for the plain-speaking of the Colonies and the desires of our Allies to have effect upon the minds of the overburdened Mr. Runciman and his staff; but the important fact remains that, unless we keep at it, everything will be far from ready when the war ends. We cannot let everything wait while political parties resume their fiscal controversies. The President has himself stated that in the trade war there are some things that "cannot wait." This report, restricted though it be in scope, must not be doomed to lie deep in departmental dust, for its purpose will not be met if we are to consider it as merely useful for making "the public" "acquainted with the information" it contains. There is too much of the stereotyped official reply "your-letter-shall-receive-attention" about this utterance. We confess that we had hoped for something better. Whether or not the committee has exceeded the anticipated scope in its recommendations, there is unquestionably much in the report which, to our way of thinking, could be adopted forthwith "without involving considerations of policy affecting many other industries and interests" unless with benefit to those industries. But we must let the report speak for itself, so we are publishing a full abstract, together with its recommendations, in our other pages, and would urge upon the Government the necessity for taking immediate steps to carry into effect those reforms upon which practically everybody is agreed.

Rubber. The recent sharp ups and downs in the price of crude rubber have left the market for this commodity in a rather uncertain state, and its future course is therefore purely problematic, while to some extent subject to the progress of the demand especially on the part of big trans-Atlantic manufacturers. There is good reason for believing that the latter made full provision for their near requirements some time ago when prices were still well under 3s. a lb., and although some considerable American buying was again experienced on the subsequent rapid rise on the way up to over 4s. for plantation rubber under the influence of the seriously threatening aspect of shipping, the demand from that quarter has been of a distinctly more parsimonious character. The fact is worth noting, however, that the recent steady fall in prices down to about 3s. per lb. has by no means paralysed the trade demand, which has indeed been proceeding on a fairly satisfactory scale. When the price was forced up to what was generally considered an artificially high level, within a period of comparative scarcity on the spot, quite a number of consumers kept out of the market, but the subsequent fall has given them an opportunity to cover their needs to a moderate extent. The price of the commodity is certainly quite high enough in the neighbourhood of 3s., but the market, nevertheless, shows wonderful resistance at that level in spite of the fact that the position on the spot has been eased considerably of late by very liberal arrivals which has resulted in a gradual increase of the warehouse stocks. There can no longer be any fear of a shortage, for indications are precisely the other way, while quite heavy quantities are afloat from the Eastern plantation districts. Eastern shipments are now being diverted *viâ* the Cape route for there is not much chance of further shipments through the Suez Canal for some time to come in view of the precarious state of shipping across the Suez Canal and the Mediterranean. The rubber coming *viâ* the Cape will probably be a longer time in transit, but there is reason for assuming that the delay thus incurred will not be quite so serious as was apprehended at first. The progress of consumption in allied and neutral countries within the last six months has certainly surpassed the most sanguine expectations, and it is pretty certain that this progress will not be materially impaired so long as the war lasts, provided prices are kept within reasonable bounds. It is well to bear in mind that production has been making substantial headway in the Eastern plantations. The belief is now in fact expressed that the further excess of the output for the current year will be considerably above original expectations. There is still a little uneasiness on that score in the trans-Atlantic trade, and this tends to explain the comparatively keener demand which is still being experienced for delivery within the next few months, for which a small premium is obtainable over the prices current on the spot.

The Eastbourne Switch-pillar Fatality. Elsewhere in this issue, by the courtesy of the Board of Trade, we are enabled to publish a report which has been prepared by Mr. A. P. Trotter, electrical adviser to the Board, with regard to the fatal accident at Eastbourne on Boxing Day. It will be seen that the report makes certain recommendations, to some of which no exception can be taken. Obviously, for various reasons, it is desirable that the switch-pillars should be placed in side streets, and away from the edge of the footpath; this would have the advantage of avoiding obstruction to traffic, and generally, in the case of new work, there would be no difficulty and little expense in following this course. Clauses 6 to 8 also appear reasonable, but Clauses 3, 4, and 5 reflect that spirit which, before the war, could be discerned in so many official decrees, especially in connection with electrical undertakings of every description. We refer to the bureaucratic tendency continually to impose fresh burdens upon them, to add to the multitude of restrictions by which they are bound.

New regulations are constantly being drawn up with the object of saving life, an aim which commands the approval of every citizen; but there is a reasonable limit to all such precautions, and care should be taken that the want of a due sense of proportion does not lead to the perpetration of absurdities.

In this case, the first on record in which life has been lost due to the smashing of a switch-pillar, a result which,

Mr. Trotter says, could not have happened if the aggressor had been either a gig or a traction engine, but only when it was a motor-car, the immediate outcome has been the issue of a series of recommendations apparently based upon our military experience during the war: retreat beyond the reach of the enemy, throw up a first line of defence, 6 in. high × 20 ft. long, fortify the position with stone fenders or cast-iron spurs, fill the pillar with wire entanglements so as to ensure short circuits and dead earths, and so on—why all this panic? Men and women are dying in hundreds around us—in the metropolitan area alone on the average three persons are killed every day by vehicles, and nearly 80 are injured, but no suggestion is made to fit all vehicles with pneumatic buffers or to provide pedestrians with compulsory crinolines.

As in the case of so many legislative acts, the restrictions thus imposed may introduce other and new dangers. For example, if the Eastbourne switch-pillar had been fortified with a massive kerb, concrete pillars, &c., as suggested, it would not have given way—but the car would, and in all probability some of its occupants would have been killed. Or a person stepping off or upon the high kerbstone in the dark might stumble and crack his skull—many a man has lost his life by simpler means. The dangers of street-boxes containing high-pressure apparatus are well known. What is the use of trying to stop up mesh by mesh the sieve through which human life is always pouring by myriad paths? In our opinion, there is no need for any official action arising out of this unique accident.

German Electrical Companies After the War.

AT the recent general meeting of the Siemens & Halske Co., held in Berlin, Dr. F. A. Spiecker stated, on behalf of the directors, that it was well to assume that the new financial year would remain under the influence of the conditions of war, although, perhaps, to a diminished extent. It was probably premature to form an opinion as to the period following the conclusion of peace, but, from the company's point of view, they believed that they could look forward to it with some confidence. The amount of their credit at the banks, and that of the Siemens-Schuckert Works, were now greater than were shown in the balance-sheets, and the companies, therefore, had at disposal such considerable funds that they were fully equal to all demands which could be made upon them, especially after the declaration of peace. Concerning the proposed efforts to establish a Government monopoly in the electricity industry, the speaker stated that no idea could be formed of the possible effects before they knew what the Empire or the individual States had in contemplation. The directors' only interest in the matter was for the supply of electric power in the whole of the country to develop. If the State assisted this development so that electric power was obtainable at low prices, the company's special interests as manufacturers would be assisted too. It would be otherwise, however, if the State's designs and measures were to exercise a paralysing effect. The speaker said that orders continued to arrive from neutral countries, although not to the same extent as prior to the war. At the general meeting of the Electricity Co. (late Schuckert) of Nuremberg, general manager von Petri remarked that not much could be said in regard to the company's foreign undertakings because very little information was available. The promotion of undertakings abroad had greatly suffered under the influence of the war, but the manufacturing activity of the Siemens-Schuckert Works had rapidly been accommodated to the situation. It had been found that business in undertakings outside of Germany was accompanied by enormous risks. The company, however, would not allow itself to be disconcerted in its policy in that direction, but would continue it after the war though a different course would be assumed in the selection of the countries and the objects of the undertakings, as a result of the experience gained during the war.

BRITISH TRADE AFTER THE WAR.

THE following is an abstract of the report of a sub-committee of the Advisory Committee to the Board of Trade on Commercial Intelligence with respect to measures for securing the position, after the war, of certain branches of British industry. Those branches are detailed in our leader columns to-day, where we comment upon the report.

The Basis of the Investigation.

The Committee first asked a number of representative firms and trade associations interested in the particular branches referred to, to make observations on the general question and in regard to certain possible lines of Government action which had been suggested to it. Subsequently some of those who submitted memoranda appeared before the Committee. An attempt was made to form an estimate of the value of the imports into this country under normal conditions, of goods of the kinds covered by the inquiry, and of the extent to which they are imported from enemy sources. Exact data were not available in several cases, but a table, from which we make the following extracts, shows approximately for each branch of trade the value of the imports from all sources in 1913, and the values of the imports from enemy countries, with, in the last column, some remarks as to the other sources of supply.

Item.	Value of total imports, 1913.	Value of imports in 1913 from Germany.	Value of imports in 1913 from Austria-Hungary.	Remarks.
Glassware:	£	£	£	
Flint and manufactures thereof (except bottles)	1,385,000	636,000	180,000	The principal source of supply, other than Germany, is Belgium.
Bottles	815,000	422,000	4,000	The principal source of supply, other than Germany, is France. The exports of United Kingdom manufacture under this head were valued at £606,000, of which £440,000 to British Possessions, and £186,000 to foreign countries.
China and earthenware:				
Porcelain, china ware and parian.	219,000	53,000	—	The chief source of supply is France. The exports of United Kingdom manufacture were valued at £213,000, of which £62,000 to British Possessions, and £151,000 to foreign countries.
Electrical ware, door fittings and chemical ware.	54,000	50,000	1,000	
Other earthenware (including semi-porcelain and majolica).	716,000	617,000	4,000	The exports of United Kingdom manufacture were valued at £1,917,000, of which £989,000 to British Possessions, and £928,000 to foreign countries.
Goods and electrical apparatus (other than machinery and uninsulated wire):				
Telegraph and telephone apparatus.	252,000	39,000		The imports are chiefly from Belgium and Sweden. The exports of United Kingdom manufacture under this head were valued at £290,000, of which £125,000 to British Possessions, and £165,000 to foreign countries.
Electric glow lamps.	196,000	156,000	6,000	
Parts of electric lamps.	115,000	97,000	—	
Unenumerated ..	254,000	112,000	—	The remaining imports are chiefly from the U.S.A. The exports of United Kingdom manufacture under this head were valued at £1,063,000, of which £494,000 to British Possessions, and £569,000 to foreign countries.
Electrical machinery.	1,346,000	721,000	—	There is a large importation from the U.S.A. The exports of United Kingdom manufacture under this head were valued at £2,229,000, of which £1,053,000 to British Possessions, and £1,216,000 to foreign countries.
Magnetos (estimated).	500,000	475,000	—	

The value of the imports into the United Kingdom, of goods of the kinds included within the scope of the inquiry may be taken as approximately £16,000,000, and of this total nearly £7,700,000 represented goods of German origin, and £500,000 goods of Austro-Hungarian origin. But it has to be remembered that there is also a large German and Austro-Hungarian export of these classes of goods into other parts of the British Dominions. In the absence of strictly comparable statistics, no absolutely definite figures can be given, but it is estimated that the total value of such goods imported into the five self-governing Dominions and India in 1913 cannot have been less than £3,000,000. Austro-Hungarian competition is noteworthy only in the case of jewellery and glassware. As regards German competition in the branches of trade under review, it is

to be observed that it is limited, as a rule, to certain special lines of goods and does not extend to the whole range of articles included in the class; and that in a number of cases the exports of United Kingdom manufactures included under the same general heading are larger than, or nearly as large as, the foreign imports. This is so as regards china and earthenware; telegraph and telephone apparatus; unenumerated electrical goods and apparatus; and electrical machinery.

The Committee proceeds to the consideration of the detailed representations as to the ways in which Government assistance might be given to the various branches of industry which have been under examination. We quote:—

Industrial Scientific Research.

"The value of scientific research in industry, and the desirability of Government assistance in the promotion thereof, was generally recognised both in the memoranda furnished to us and by the witnesses who appeared before us, though it was admitted that British manufacturers and workmen have not always shown themselves in the past sufficiently appreciative of the value of scientific investigation into industrial problems, or of technical training. In a number of cases reference was made to the valuable assistance given by technical institutions to German industry, and, though no very definite evidence on the point was adduced, we see no reason to doubt the validity of the opinions expressed. As regards the particular British industries with which we are now concerned, very valuable work is being done in respect of glass by the University of Sheffield and the Institute of Chemistry (by the latter body especially as regards chemical glassware and optical glass); in respect of hard porcelain, and china and earthenware generally, by the School of Pottery at Stoke-on-Trent, which is an interesting example of combined trade enterprise. . . . All these institutions are said to be handicapped by inadequate financial resources. . . . The electrical industry, of course, provides a very wide field for scientific industrial research."

"At an early stage of the inquiry our attention was directed to the fact that an extensive scheme of State aid for industrial research had recently been established by a Committee of the Privy Council, and is, we understand, to be carried out by that department in close communication with the Board of Trade. We are informed that a strong advisory council has been appointed, and that a number of applications (including requests for assistance from the Sheffield University, the Institute of Chemistry, the Stoke Pottery School, and the British Electrical and Allied Manufacturers' Association) are already before that body, and that the first grants are being made. We were accordingly able to refer to the new Council and the funds at its disposal those witnesses who expressed the desire for State assistance in this direction, and to point out to them that the Council in its consideration of any applications for help to any particular trade would no doubt be largely influenced by the extent to which the trade had already shown or would show a disposition to help itself. The new scheme is necessarily experimental, but it is capable of much enlargement, and we have no doubt that if British manufacturers are ready to co-operate with the Government in this matter and to avail themselves of the facilities put at their disposal, the operation of the scheme will be of very great value to British industry."

The recommendations of the Committee on this section of the inquiry are as follows:—

Scientific Industrial Research and Training.—(*a*) Larger sums should be placed at the disposal of the new Committee of the Privy Council, and also of the Board of Education, for the promotion of scientific and industrial research and training.

(*b*) The Universities should be encouraged to maintain and extend research work devoted to the needs of the main industry or industries located in their respective districts; and the manufacturers engaged in those industries should be encouraged to co-operate with the Universities in such work, either through their existing trade associations or through associations specially formed for the purpose. Such associations should bring to the knowledge of the Universities the difficulties and needs of the industries, and give financial and other assistance in addition to that afforded by the State. In the case of non-localised industries, trade associations should be advised to seek, in respect of centres for research, the guidance of the Advisory Council of the Committee of the Privy Council for Scientific and Industrial Research.

(*c*) An authoritative record of consultant scientists, chemists, and engineers, and of persons engaged in industrial research, should be established and maintained by some suitable Government department, for the use of manufacturers only.

Patents.

The Committee next deals with amendments of the existing law as to copyright, patents, trade marks, and merchandise marks. "Under this general heading a large number of representations were made. As regards patents, it was suggested by the representative of the fancy leather goods industry, and endorsed in some measure by the witness on behalf of the china and earthenware trade, that an inadequate search is made by the Patent Office before applications for patents are accepted, and patent rights are granted in respect of articles that have already been upon the market and are in fairly common use. It was urged that a more exhaustive inquiry should be made, responsible trade associations being taken into consultation as to the usage of an article for which an applicant is claiming a patent. In this connection reference was made to the German and United States practice, and to the supposed fact that in Germany the sealing of the patent protects the inventor against actions for infringement; but we are informed by the Patent Office that whilst both Germany and the United States profess to make comprehensive search, it has proved to be rarely possible to make such a search effective, and that in both countries the patents granted are subject to revision by the Courts. On this last point it was urged that the onus of taking action in the Courts is thrown upon the owner of an article already in use, but for which a patent has been wrongly granted, and that this is an unfair onus to place upon him." Other suggestions were made in favour of international reciprocity in patent matters.

Electrical Proposals as to Patents.

The representatives of the electrical industry made more comprehensive proposals, namely:—

(1) That three classes of patent protection be created:—

(*a*) A short term or petty patent for improvements or modifications in design, without provisional protection, and at a low cost.

(*b*) A long term patent for new inventions, the period of provisional protection being 12 months, and the full period to be at least 15 years, with an option to extend it to 21 years by payment of increased fees.

(*c*) A patent for discovery of new principles, the patentee to be permitted to claim reasonable royalties from patentees of apparatus making use of such principles.

(2) That an attempt be made to bring about the unification of the patent laws of the British Empire."

The Committee consider that the proposals under (1) call for more detailed consideration than they have been able to give them, but as regards (2) the question of the desirability of assimilating the patent laws in the United Kingdom and the Self-Governing Dominions formed the subject of discussions at the Imperial Conferences of 1902, 1907, and 1911, and of communications between the various Governments concerned during the intervening periods. At the Imperial Conference of 1911 it was unanimously agreed "that it is in the best interests of the Empire that there should be more uniformity throughout its centres and dependencies in the law of copyright, patents, trade marks, companies." The proposal made by the witnesses would appear therefore to have been long anticipated by H.M. Government, and an approach towards uniformity has been made in the recent legislation of the Australian Commonwealth and New Zealand. In this connection some exception was taken to a provision of the existing Canadian law, whereby if, after the expiration of 12 months from the granting of a patent, or any extension of such period, not exceeding one year, which may be authorised by the Commissioner of Patents on satisfactory cause being shown within three months of the expiry of the period, the patentee or any of his representatives or assigns, imports or causes to be imported into Canada the inventions for which the patent has been granted, the patent becomes void as to the interests of the importer. It was urged that this provision works to the disadvantage of the British manufacturer, as the importation of any article made under a patent in operation in Canada thus invalidates the patent, even though manufacture thereunder may be actually carried on in the Dominion, but no clear evidence as to hardship was adduced in support of this contention. Canada is the only one of the Dominions which has thought it necessary to embody such a provision in its law, and its action is probably due to the geographical propinquity of the United States. In contrast to this particular complaint of the B.E.A.M.A., one correspondent engaged in the glass industry urged that all British patents should be worked in the United Kingdom, and no articles manufactured abroad for which British patents are granted should be allowed to be imported (with possible exceptions). The same writer was of opinion (which in this instance was shared by others) that the provisions of the patent laws as to compulsory working should be more stringently enforced.

The Committee's recommendations are as follows:—

Patents.—(*a*) The efforts which have been made to secure uniformity of Patent Law throughout the Empire should be continued. (*b*) The provisions of the law as to the compulsory working of patents in the United Kingdom should be more rigorously enforced, and inspectors should be appointed to secure that such working is complete and not (as has frequently been the case) only partial. (*c*) The fullest possible information as to enemy patents should be given to British firms during the war, and every practicable assistance for their use.

Transport Facilities.

The evidence presented showed clearly that there is widespread dissatisfaction with the working of the United Kingdom railway system, and a general belief that the State railway system of Germany is operated greatly to the advantage of the export trade. Thus as regards china and earthenware, we were informed that "the very reasonable cost of transport, and the facilities given by the German Government operate against the (British) pottery manufacturers in competition for the trade of the United States and Canada, and of our Colonies generally." Whilst we have no evidence that rates for inland carriage of goods in Germany are generally lower than those prevailing in this country, when due allowance is made for the differences between the services covered

by the two sets of rates, there can, we think, be no doubt that the German export trade has been largely assisted and stimulated by the special low rates granted on the German railways in respect of goods for export—rates which, in the case of certain combined railway and shipping rates, are believed to have been quite exceptionally low. We are also disposed to think that there is some foundation for the belief that the German railway authorities have, as a rule, shown themselves more ready to give special facilities to individual traders, and to have more regard for their individual circumstances, than has been the policy of the British railway companies. It is evident, also, that there is a widespread belief amongst manufacturers and traders generally that foreign goods are carried inland from British ports at lower rates than those charged for the carriage of British goods over similar distances, and that whatever theoretic arguments may be advanced in justification of such action by the British railways, it does, in fact, operate as an appreciable handicap to British manufacturers in meeting foreign competition. This was urged, for example, by the British Electrical and Allied Manufacturers' Association. It was urged by the representatives of the paper-making industry that railway companies should be required to divide up any through rates charged by them on imported goods, so that the actual rates charged in respect of land carriage could be publicly known. It was stated that a suspicion existed that foreign imported goods are sometimes rated in a different classification to British goods of the same kind.

B.E.A.M.A. Suggestions.

The Committee direct special attention to two suggestions put forward by the B.E.A.M.A., namely:—

(1) That the Board of Trade should, as soon as possible, call together a conference of representatives of shipowners, railway companies, and the manufacturing industries, to discuss the whole question with a view to co-operation in removing the existing handicaps under which British industries labour when in competition with foreign producers; and

(2) That an impartial tribunal of the Government be set up to exercise the functions of a tribunal for adjusting grievances existing between railway and transport companies and traders, more particularly where it can be shown that the foreigner is benefiting at the expense of British industry.

"With regard to the second suggestion, in the opinion of the witnesses the Railway and Canals Commission is not a suitable body for the exercise of these functions, as there is no adequate representation of commercial interests and experience, and its procedure is both too slow and too costly. We drew the attention of the witnesses to the fact that the elaborate investigation conducted by the Royal Commission on Railways is only in suspense owing to the war, and we urged upon them the desirability of making full representations to that body, and to furnish in support of their case the fullest possible details, instead of relying, as has not infrequently been the case, on quite general statements. Reference was made by some of the witnesses to the advantages which German trade derives from the facilities for cheap carriage, especially of bulky goods, afforded by its elaborate river and canal system, and regret was expressed at the comparative inutility to which the British canals have been reduced by railway ownership, and at the failure of H.M. Government to take any action on the report of the Royal Commission on Canals. Attention was drawn by some of the witnesses to the handicap imposed on British manufacturers before the war by the fact that in some cases British shipping companies carried continental goods from a continental port to extra-European destinations at freights lower than, or as low as, those charged on the same goods from a British port, even though the continental goods were actually carried *vid* such British port.

The Committee's recommendations are:—

Transport Facilities.—(*a*) An impartial tribunal should be set up to secure that no preference is accorded to traders in other countries by British shipping companies or shipowners, or by home railways; that is, that rates charged by British shipping companies, shipowners and railways to British traders shall in no case be higher under similar conditions than those charged to traders operating from another country, the principle adopted being that equality of payment entitles traders to equality of services. (*b*) A definite policy for the improvement and extension of the canal system of the United Kingdom should be formulated, with a view to its being carried out so soon as the national finances shall permit. (*c*) Shipping companies should be prohibited from charging higher rates of freight from British ports than from any North European ports.

Industrial Finance.

"There was a general consensus of opinion among the witnesses that the German manufacturers receive much greater and readier assistance from banks and financial houses than do their British competitors. In a number of cases it was suggested that German industry, and especially the export trade, is actually subsidised by the German Government, but apart from the special railway rates for export, to which reference has already been made, we have no evidence of this, and we are disposed to think that the belief has no other basis than the banking facilities already mentioned. Of the importance of these there can be no doubt. Thus it was pointed out to us by the representatives of the B.E.A.M.A. that there have been carried out by German firms, in British Dominions and Colonies, many engineering works of considerable magnitude which could have been equally well undertaken by British firms if the latter could have received similar financial assistance. It was also stated that the attitude of British financiers towards home industries is in direct contrast with that of German financiers, who invariably stipulate that the plant and machinery for the undertakings they assist shall be of German manufacture. We recognise fully that the conditions of German industry and its rapid growth in a country not possessed of large accumulated financial resources have caused German manufacturers to be much more dependent on the provision of facilities of the kind now in question than are their British competitors; that the principles of German banking differ widely from those which govern the policy of the British banks, and involve serious risk; and that the imposition of conditions as to foreign loans might exercise an adverse influence upon the position which London had held, until the outbreak of the war, as the chief loan market of the world, with the resultant considerable advantage to British trade as a whole. At the same time, some witnesses appeared to think that there is a large body of British manufacturers to whom a well-ordered system of industrial banks would be of very appreciable assistance. In this connection our attention was drawn to one disadvantage of the recent development of the joint-stock banking system. It was suggested to us that the old local proprietary banks were more inclined to give credit to local small manufacturers, with whose position they were intimately acquainted, than are the great combinations into which the local banks have generally been absorbed. The local manager is unable to take the risk which the local banker often took, and is indisposed to advise his principals to make any advances which even appear to carry with them any element of risk. We are of opinion that there is a good deal of truth in this view of the situation, and that the development of joint-stock banking has in some measure restricted the financial facilities of the smaller industrial enterprises."

The Committee recommends:—

Financial Assistance.—(*a*) The Joint Stock Banks should be invited by H.M. Government, so soon as opportunity offers, to consider the possibility of affording a greater measure of assistance to British industrial enterprise. (*b*) All Government departments, local authorities, and statutory bodies entrusted with the control of moneys raised by taxes or rates, should be under legal obligation to purchase, so far as possible, only goods produced within the British Empire. To meet exceptional cases, the Board of Trade might be empowered to grant licences to public bodies for the purchase of foreign goods where special circumstances, including, for example, the existence of a combine or "trust," can be proved. (*c*) British financial houses concerned in the issue of foreign loans in the United Kingdom should be urged to endeavour to secure that preferential treatment be accorded to British contractors and manufacturers in respect of the public works to be carried out by means of such loans.

(To be concluded.)

MUNICIPAL ELECTRICITY SUPPLY AT JOHANNESBURG.

BY R. TURNBULL MAWDESLEY.

(*Concluded from page* 155.)

In the inner areas the cables have been laid underground as far as possible, but in the suburban areas the wires are carried overhead, and this is a certain source of trouble during the very severe lightning storms which occur in the summer months.

The street lighting, on those streets along which the cars run, is carried out by incandescent lamps suspended from the trolley-span wires, and by incandescent lamps on pavement standards elsewhere.

Average summer and winter load curves are shown in fig. 12. (It should be noted that, as Johannesburg is south of the Line, the winter months are from April to September.)

The curves shown do not differ in any material way, in shape, from those of the moderately-sized lighting station at home—and it is strikingly obvious, on inspecting the shape of the Johannesburg load curve, that the installation of a storage battery of large capacity would be the means of cutting off the peak, and filling up the valley after 10 p.m., and thus considerably increasing the station efficiency.

The great difference between the summer and winter curves is due to two causes—one being the cold weather (when many electric heaters are in service), and the other the shop and office lighting, all shops promptly closing at 6 p.m.

The direct-current load on the converters is also given, and it will be noticed that in the summer time the converter load drops considerably before the peak load. The reason for this is that the two turbines (6,000 KW.) on load, are loaded up by the A.C. feeder load before the converters can be fully loaded on the D.C. side.

In the winter time the converters can be fully loaded at the peak, as there are then three turbines (9,000 KW.) on load. A slight alteration has recently taken place in the average shape of the curve, and especially the converter load curve, owing to the rotary sub-station at Jeppestown taking part (about 18 per cent.) of the traction load. When the second rotary sub-station at the "Zoo" is in operation, about 30 per cent. of the traction load will be handled by the sub-stations; and the D.C. generators (and converters) in the main station will be relieved of this amount of load.

During November, 1914, 1,248.457 units were generated for lighting and power, and 597.277 units for traction. These statistics cover a summer month, and the figures would be higher for a winter month. The total number of connections made at the end of November was 15,625 KW.

Referring briefly to the tramways, there are 124 cars in daily service, the cars being partly of the single-truck double-deck type, with the upper deck roofed in, and with adjustable blind screens at the sides, and partly double bogie cars of the same type.

There are also in service at the time of writing two Tilling-Stevens petrol-electric single-deck "pay-as-you-enter" 'buses, which are used as feeders to the tramways.

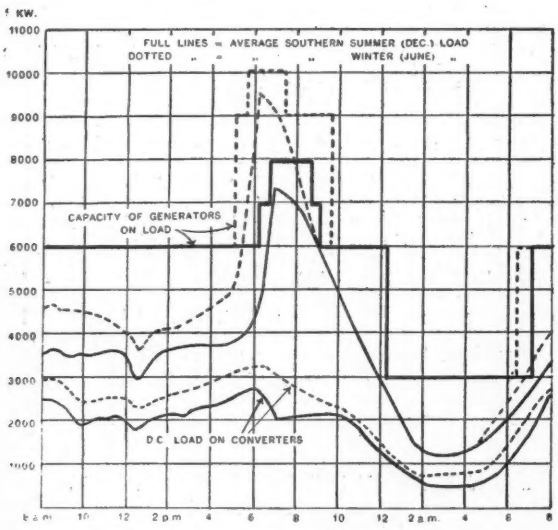


FIG. 12.—AVERAGE DAILY LOAD CURVES.

The minimum fare is 1½d. Incidentally, it may be observed that until quite recently the "tickey" (three-penny silver piece) was the coin of smallest value in general circulation, and even daily newspapers were sold at this price; but this artificial price was reduced recently to 1d., which in its turn has brought about a more general circulation of "coppers."

There is an agitation for the substitution of 1d. fares, but the general manager, in a report upon the subject, recommends the Committee to retain the existing fares for the time being; however, there can be little doubt that 1d. fares will be substituted in the near future.

"Change" on the cars is given by means of tokens valued at 1½d., and books of tickets are on sale at 33 per cent. reduction.

Regarding the permanent-way construction, there is nothing of note to be recorded. In the main thoroughfares the trolley wires are supported by span wires, and elsewhere by side-arm poles.

One petrol-engine tower-wagon and two track tower-wagons are in service for breakdowns and maintenance, and the whole of the cars are housed in sheds adjacent to the power station. The necessary repair shops, &c., are all centrally situated.

The tramway traffic returns do not vary to any extent, except upon holidays or *fête* days. For the week ending August 8th, 1914, the figures were (as compared with the same period of 1913):—

	1914.	1913.
Car-miles run	66,869	65,873
Receipts	£6,305 14s.	£6,586 8s.
Average receipts per car-mile	22·8d.	23·9d.

The average number of passengers carried monthly is 2,600,000, and the average car-milage is per month about 275,000. The present average receipts per car-mile are 2s. 2d., with 9·5 passengers carried per car-mile.

The concrete and stone building which housed the gas-engine plant has been converted partly into a car-repair shop and partly into a car-shed. This building also contains a small motor-generator for the purpose of charging the cells of an electric vehicle used in distribution work.

There is a fleet of three motor-cars for the use of the Departmental officials, and a number of motor-cycles for the mains foreman, which are all garaged and kept in order by the Department.

Finally, no account of the Johannesburg power plant would be complete without some reference to the assistant engineers who have shared in the work. Mr. E. T. Price is the chief electrical engineering assistant, under whom all electrical engineering work is carried out. Mr. J. B. Milford is the traffic manager of the tramways, and Mr. O. Petersen the resident station engineer.

NOTES FROM CANADA.

[FROM OUR SPECIAL CORRESPONDENT.]

THIS country, like the rest of the Empire, is devoting its energies largely to war, and a large part of the trade, even in manufactures other than war materials, is more or less indirectly an outcome of the requirements created by the demand for munitions, uniforms, &c. Naturally, a good deal of capital is being expended on the establishment of new, and the extension of existing, works and factories for war work, but side by side with this there is a considerable amount of planning for the future, based on the confident expectation that the Allies will be victorious.

On the outbreak of war Canada had many unemployed, and people wondered how she would come through; but now, owing to enlistments and to the enormous increase in the country's trade—this increase is altogether in exports, as imports have dropped very greatly—there is but little unemployment and the Dominion prospers financially as never before. If only this prosperity were unaccompanied by the sadness and sorrows which come to so many of those who have relatives at the Front, there would be cause for rejoicing indeed.

Apart from these things, conditions are much as usual; there are, of course, no Zeppelin raids and no darkening of streets and window lights, and if it were not for the presence of innumerable soldiers at every turn, the average man not engaged on war work would hardly notice much difference from ordinary peace times.

In the field of electrical engineering, several fairly big schemes are being projected.

At Edmonton, in Alberta, an agreement between the city and the Edmonton Power Co. has recently been approved.

The company is to supply electricity for 30 years, at prices ranging from 1·3 cents per KW.-hour to 0·85 cent, according to the demand. The power of the Saskatchewan River will be utilised, but an artificial lake will have to be created, and a total ultimate expenditure of about £1,200,000 is contemplated. Edmonton at present has a steam plant, and the company undertakes to run this until the hydroelectric scheme is in operation, which will be some three or four years hence.

The Montreal Tramways Co. is increasing its present steam plant from 10,000 H.P. to 50,000 H.P., and another plant in this city is to be built having a capacity of 60,000 H.P. A 15,000-H.P. steam turbine unit will be the first to go in.

One of the great features recently has been the voting of the people of various interested municipalities in Ontario on the question of hydro-radials. A little explanation appears necessary here: the Hydro-Electric Power Commission of Ontario has for some time been working on plans for a system of electric railways to form a network linking up the important towns, and providing facilities for rapid and cheap passenger and freight service serving both towns and rural districts.

A start on this kind of work was definitely made when the formal opening of the London and Port Stanley Railway took place last July. The Commission undertook the work of electrifying this line, which was formerly steam-operated, and is about 30 miles in length. It has been working successfully since the summer, and is now said to be making a profit of about £200 per month.

At the January elections, which took place on the 1st of this month, the people of the towns and country districts concerned were asked to vote on the question whether they wished the Hydro-Electric Power Commission actively to take up the "hydro-

radial" work or not. This resolved itself into a question of public *versus* private ownership, and a big fight was made by the advocates of the latter, but the Commission carried the day with, in nearly every instance, very large majorities. The vote was given on the understanding that only preliminary work will be undertaken during the war, as the spending of such a large sum of money as even the present plans would involve would be a wrong policy just now, covering, as they do, an area nearly as large as England, in Southern, and especially in South-Western, Ontario.

Another matter closely connected with the foregoing is the absolute necessity under which the Commission is even now placed of going ahead with some scheme for securing more power. Five or six years ago a contract was made with the Ontario Power Co., at Niagara Falls, for the supply of power, in blocks as required, up to a maximum of 100,000 H.P. At the time Sir Adam Beck was told that it would be 20 years before he would require even 10,000 H.P., or something to that effect, but a few weeks ago the Commission's maximum load exceeded 110,000 H.P., and it is steadily growing as new municipalities are taking power, and those already connected to the system are increasing their demands. This tremendous growth has enabled the Commission to reduce the rates charged to the municipalities each year, and this month reduced rates for no fewer than 66 towns and rural districts have been published; in some of them the consumers will get energy for domestic service at as low a rate as 0·9 cent per KW.-hour.

In order to meet the demand for power, the Commission has had to make arrangements with another company at Niagara Falls, but the price being paid is naturally much higher than for the 100,000 H.P. originally contracted for.

Plans have already been drawn up by the Commission's engineers, however, for a scheme whereby 600,000 H.P. can be developed at Niagara Falls on the Canadian side, and these will be considered by the Provincial Government next month, when it is highly probable that approval will be forthcoming, as now that the people have expressed their desire to have publicly-owned electric railways, the development of this power is a greater necessity than ever.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Driving Paper-Making Machinery.

A catalogue recently issued by Messrs. Mather & Platt, Ltd., of Park Works, Manchester, which deals, not with paper-making machinery itself—for the firm does not produce this class of apparatus—but with auxiliary machinery that is of importance in paper mills, contains illustrations of electric motors that have been supplied to paper mills throughout the country; included

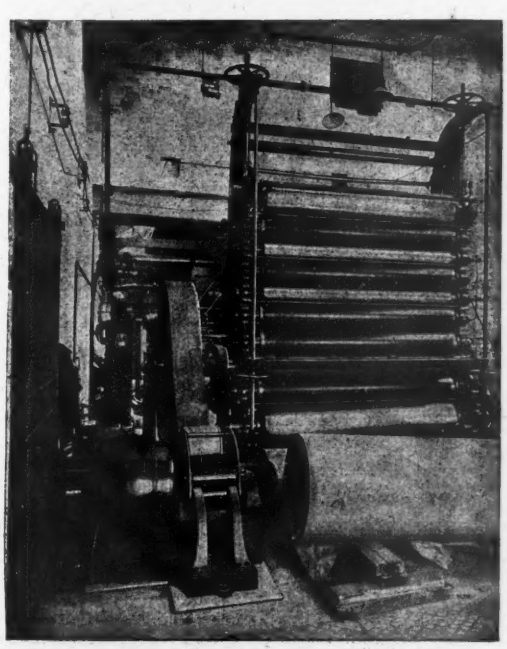


Fig. 1.—Electric Drive of Super-Calender.

amongst these is the interesting application shown in fig. 1, which illustrates a 100-H.P. "P" type motor driving a 10-bowl super-calender in a Horwich paper mill. In order to obtain, in the most economical manner, the minute variations of speed over a very wide range that are necessary in operating a super-calender, a motor-driven booster is provided. This arrangement permits of obtaining any speed between 30 ft. and 500 ft. per minute by the movement of a small hand-wheel, without loss through the employment of resistances. Among the largest paper-mill installations for which the firm have been responsible is that at the works of the Culter Mills Paper Co., Peterculter, Aberdeen, where upwards of 30 motors, with an aggregate capacity of 500 H.P., have been installed; the Darwen Paper Mill Co. uses a D.C. Mather & Platt generator of 200 KW., and Messrs. Chas. Marsden & Co., Ltd., Barnsley, employ a rope-driven 350-KW. generator and a smaller set with an output of 85 KW., the motor equipment including one of 100 H.P. and about 30 others, with a combined horse-power of something like 550. At the East Lancashire Paper Mill, Radcliffe, also, 30 similar motors are running, totalling over 500 H.P., and taking current from three generators with an output of about 550 KW.

Large Jackson Cookers.

We briefly referred in our issue of December 25th to the large Jackson electric ovens being constructed for the Park Prewett Asylum, which is being adapted for hospital purposes. Two large ovens and three smaller ones are being supplied, the former built up with a cast-iron framework, sheet-metal sides and double doors, and the latter consisting of a cast-iron oven with a sheet metal grill above it. Both types of equipment are lined internally with porcelain enamelled steel and suitably lagged.

The large ovens measure internally 2 ft. 9 in. wide × 2 ft. 6 in. deep and 4 ft. 6 in. high, and will take 300 lb. of meat. They are heated by nests of red-hot type heating bars disposed on either side, and consisting of 44 of the standard Jackson bars, described in our issue of December 25th, arranged to give the required heat distribution. These heating elements are protected by perforated metal plates inside the oven. Four heat regulations are provided, controlled by four single-pole Diamond H switches, and the maximum loading is 15 KW.

The smaller type of oven supplied measures 26 in. × 24 in. × 23 in. internally, and has a loading of 5·5 KW., with three heat regulation, the oven heating being on similar lines to the larger oven; the grill above has a 6-KW. loading. In both types of oven the wiring to the heaters is external, with non-combustible covering, and is run in sheet-metal casing to the back and thence through flexible metallic tubing to the switchboard.

We are indebted to the Jackson Electric Stove Co., Ltd., of Blandford Street, W., for allowing us to inspect this interesting equipment.

PROTECTION FROM X-RAYS.

At the meeting of the Röntgen Society on February 1st a discussion took place on the subject of protective devices for X-ray operators. Dr. Sidney Russ, the opener, pointed out that although X-ray dangers were becoming less formidable, owing to the more general knowledge of the peril, yet at the same time the neglect of precautions was all the more serious on account of the increasing power of X-ray outfits. The X-ray outfit of the most modern type was capable of fifty times greater power than the ordinary outfit of ten years ago. He thought that X-ray workers would prefer not to invoke legislation on this subject if sufficient protection could be obtained by other means, for of all the methods available for ensuring it, legislation would be the least popular and the least convenient. He and other speakers suggested that certificates of safety should be given with X-ray apparatus.

In the course of the discussion, Mr. H. E. Donnithorne showed that even protective devices themselves might be a source of danger, instancing a couch which was furnished with a protective metal surface at a certain angle which the X-ray beam was just able to graze. The incident radiation was thereupon increased, and this he attributed to the generation of secondary rays from the metal itself.

Dr. F. Bailey, of Brighton, said that his own practice was to shelter himself behind a large screen, the upper third of which consisted of lead glass, and also to enclose his tube in a large lead-glass bulb. In this way the operator could hardly receive any direct X-rays at all, but he still remained subject to the ionised atmosphere of the X-ray room and its possible dangers.

Dr. W. Harwood Nutt said that some X-ray workers wer returning from the seat of war with very bad ulcers on the arms and hands, and he did not believe that any man could protect himself adequately, however much he was clothed with aprons and gloves, &c., unless the tube also was enclosed. The effects of atmospheric ionisation might be overcome by efficient ventilation, using two electric fans, one drawing the air into the room, and the other drawing it out.

Dr. Herschel Harris thought that the great fault was in the glass supplied for protective purposes. It was often not lead glass nor X-ray proof at all, and the makers should be asked in all cases to notify their customers as to the quality of the glass they supplied.

Copper in Germany.—The quotations for copper wire in Germany have shown a steady rise. For 100 m. of insulated wire of 1 mm.² section 45 francs is paid, and, in some cases, even as much as 60 francs is asked. The quotations for zinc wire, on the other hand, seem to be quite normal, and this metal is generally employed.—*L'Industrie Electrique.*

D

THE EASTBOURNE FATALITY.

The following report has been prepared for the Board of Trade by its electrical adviser, Mr. A. P. Trotter, with reference to the fatal accident which occurred at Eastbourne in December last:—

On December 26th, 1915, a large motor car, proceeding at a moderate speed along the near side of a broad thoroughfare in Eastbourne, named Seaside, unaccountably swerved to the left and smashed an electric switch pillar into fragments. It was brought up by collision with a tree a few feet further on. The occupants of the car, two nurses and two children, were unhurt, but two men who afterwards tried to move the car were killed by electric shock. There are no obscure or doubtful points about the accident. The circumstances are quite clear.

The pillar was about 4 ft. x 2 ft. 2 in. x 1 ft. 9 in. It was constructed of cast iron; the minimum thickness was about half an inch. It stood at the edge of the footpath, which was not provided with any curb. The pillar contained three switch-fuses of the cartridge type for the purpose of connecting cables branching in three directions from this point. The cables are lead-covered, paper-insulated, concentric, for a supply of single-phase alternating current at 2,200 volts. At about 6 in. above the ground level there was a horizontal bus-bar to which the external conductors were connected by links. The lower part of the switch-fuses was about 3 ft. above the ground level, and they were connected with the inner conductors of the cables by "tails" of 7/16s about 18 in. in length. When the pillar was destroyed no connections pulled out, but the "tails" were cut through, and the end of one showed signs of fusion.

The pillar was supplied through a feeder, and owing to a momentary earth at the instant of the collision, the oil-switch on this feeder at the works tripped. The switchboard attendant replaced it, and it held in, showing that there was no short-circuit or heavy earth. The supply was further complicated by being fed from a sub-station, and by the stepping-up through transformers of the low-pressure supply, but that need not be considered.

Two men tried to push the car back on to the road. Several persons who touched it received shocks. The driver alighted and opened the bonnet, and received a slight shock which he attributed to the electrical accumulator on the car. The severe shocks received by the two men may have been due to the firm grasp which they gave, or perhaps the car did not make contact with the upstanding wire until it had been moved. It was not clear from the evidence given at the Coroner's inquest whether the car was moved or not. That is of no importance.

The driver attempted to pull one of the men off by grasping his waist with both hands. In doing this he received a shock of sufficient strength to knock him down. An attempt was made by the bystanders to pull the men off with a wire rope. They received severe shocks and burns. If a hemp rope had been used, the day being dry, they might have rescued the men without difficulty, or they could have pulled them away by loose parts of their clothing. If after getting them clear the well-known method of artificial respiration had been practised, the lives of these two men might have been saved.

If the pillar had been smashed by a runaway vehicle constructed mainly of wood, such an accident would hardly have occurred, and if by a traction engine with iron wheels, it would have been impossible, for a better contact with earth would be made by the wheels than by the feet of the bystanders. The insulation of the car on its rubber tires was an important cause of the fatal result.

The Board of Trade Regulations recognise sub-stations and street boxes. The former are receptacles for transformers large enough to admit the entrance of a person after the transformers, &c., are in position. It is recommended that they should be above ground wherever possible.

The regulations relating to street boxes imply that they will be constructed below the level of the road or pavement, and will be provided with covers forming part of the surface of the street. In addition to regulations relating to sub-stations and to street boxes, Regulation 18 provides that "every portion of any high-pressure electric line placed above the surface of the ground . . . shall be completely enclosed either in a tube of highly-insulating material embedded in brickwork, masonry, or cement concrete, or in strong metal casing efficiently connected with earth."

Pillar boxes of a kind similar to the one which was destroyed at Eastbourne have been broken by collisions with vehicles, and until recently a pillar of the dimensions and construction of this one might have been considered to comply with the regulation. But in view of the increased speed and weight of street vehicles, and their imperfect control and skidding, further attention must be given to the use of such electric pillars in the streets. This is not the first case in which the cast-iron case of a pillar has been destroyed without causing a dead earth or short-circuit among the live conductors contained in it.

Various troubles with underground street boxes resulted in the introduction of pillars, but local authorities have, with but few exceptions, permitted their use only on their own electrical undertakings. For low-pressure work, pillars present many advantages over street boxes, and are to be recommended. In the case of high-pressure distribution the accident to be feared was the possibility of the pillar becoming alive due to the bad action of a fuse or to some other defect. It was anticipated that both in the case of large transformer kiosks and of such pillars as are used at Eastbourne and elsewhere, any serious damage by a collision would cause an earth or a short-circuit which would trip the supply switch.

In most of the larger modern systems of electrical distribution supply is given at extra-high pressure to sub-stations from which medium or low-pressure mains distribute the supply to consumers. In such cases there are no high-pressure mains, and no switch pillars are used.

In older systems, such as that of Eastbourne, high-pressure feeders, originally radiating from the generating station, have become a highly complicated network. This generally arises from the necessity for tapping tees to feeders for the supply to new districts. It would be desirable in these cases that sub-stations should be increased in size or in number, and that the use of street-box transformers should be restricted, and that the lay-out of the feeders should be so simplified that tee-joints are avoided and that switch pillars or boxes need be used only in exceptional cases.

Before proceeding to consider what modifications should be made in electric switch pillars, the employment of high-pressure switches in underground street boxes may be mentioned. Many engineers have strong objections to this alternative, chiefly on account of danger to workmen who have to use them, and on account of failure of such apparatus to work properly. But investigation shows that this is another way of stating the fact that many objectionable kinds of street-box switches have been tried, the unsatisfactory results have been very apparent and sometimes serious; while a few well-designed underground high-pressure switches have worked well for years and neither require nor attract attention. Besides these, which are non-automatic and do not contain fuses, totally enclosed oil-switches with overload trip are used in mines, and could easily be adapted for street boxes.

Recommendations as to Electric Pillar Boxes for use with High-pressure Supply.

1. The suggestion made by the Coroner's jury that pillar boxes should be placed further away from the side of the road is good. It is better to place them in side streets than in main thoroughfares. If possible, they should be built into the walls of houses or gardens. Local authorities should use their influence to obtain accommodation for such boxes on reasonable terms.

2. Where pillars can be moved back from the curb by slewing the cables without entailing undue expense in cutting and re-jointing, this is desirable.

3. A curb not less than 6 in. high extending not less than 10 ft. on each side of the pillar is desirable.

4. Where pillars are set near a curb, fenders or "spurs" of rounded blocks of stone or of strong iron castings could usefully be set at the corners of pillars facing the road. A door opening on to the street must be shaped to clear them.

5. Cast-iron pillars should be reinforced by a cage of wrought-iron rods incorporated in, or attached to, the cast-iron, which will tend to hold the fragments together in case of destruction, or an inner lining of sheet or of expanded metal or wire mesh should be attached to the pillar and to the doors, and the pillar should be connected to a substantial earth-plate as well as to the lead of the cables.

6. Loose "tails" of rubber-covered wires are highly objectionable, and should be avoided by enclosing them in a metal tube carefully earthed, and filled in solid with compound.

7. It is not desirable that transformers should be placed in pillars above ground, unless loose wires and cables and exposed live parts can be altogether avoided. Where street boxes are used as transformer chambers they should be placed below ground, and properly designed switch pillars may be set over them, or, preferably, they may be built into a wall.

8. The foregoing recommendations may be applied also to low and medium-pressure pillars.

THE DESIGN OF HIGH-PRESSURE DISTRIBUTION SYSTEMS.

In the course of the discussion on Mr. Beard's paper by the Western Local Section of the Institution of Electrical Engineers, Mr. W. A. Chamen said that he took the author's statement that as time went on they would do more and more of their distribution at high pressure to mean that they would do far less of what he called low-tension distribution from any one sub-station. They would cut up their areas, and divide them over a much larger number of E.H.T. transformer sub-stations. It would be of interest to know what would be the effect if some of the waste-heat stations, from accident or any cause, suddenly ceased giving their supply. With regard to overhead lines in South Wales, in each case where they put up an overhead line working at 11,000 volts the birds had at first been a great trouble. They stood on the cross-arms or pole tops and managed to reach the wires, causing a short-circuit, and sometimes shutting down the supply as well as killing themselves. This happened for a little time,

but soon the birds began to learn—at least the next generation of birds did—that it was dangerous, and this trouble ceased.

Mr. J. W. Burr said he supposed the author's idea was to have many high-pressure sub-stations and to supply only in the immediate locality of these sub-stations with low pressure. This would obviously require not only a great number of sub-stations but also a dense distribution area in their neighbourhood. The majority of central station engineers had not to deal with an area in which this was possible. Regarding the suitability of supply, obviously this must suit the consumers' requirements. A short time ago he was requested to give a supply to a large works, and suggested that they should take low-tension 3-phase alternating current. It was, however, pointed out that they had already a continuous-current installation at 235 volts, and it was, therefore, necessary to install a rotary converter at their particular voltage or lose the business. He agreed that money spent on preventing or minimising an interruption to the supply was money well spent, since reliability of supply must be one of their first considerations. In some cases the use of automatic apparatus was overdone; he would rather rely to some extent upon the attendant and employ qualified men. After all, even automatic contrivances sometimes went wrong. He suggested that a frequency of 50 was high for power distribution. The inductance voltage was directly proportional to the frequency, and as this factor limited the power which could be transmitted over any line it surely should be reduced as much as possible. He had been under the impression that switchgear was designed to-day that would operate successfully under almost any condition of working. He was of the opinion that it did not normally pay to operate cables at the maximum current density allowed by heating limits.

Mr. C. F. Proctor inquired what was the maximum output of the Newcastle stations, and the proportion between the power generated by the waste-heat stations and that of the main stations. He also asked whether in extra-high-tension switchboards trouble had been experienced from static charges of the parts; in a 17,000-volt switchboard he saw tested some years ago he noticed that sparks passed between any two metal parts (such as two screws) close together, although they were not supposed to be in electrical contact with any live parts.

Mr. F. Tremain was surprised to hear that the breakdowns of overhead lines were only twice as frequent as those on underground cables. A 2 to 1 ratio did not seem, at first sight, to be sufficient difference between overhead and underground systems to justify the greater cost of subterranean cables.

Mr. C. T. Allan agreed that the interconnected system was the most economical, but the problem was how to introduce the protective apparatus upon an existing system having cables already laid. With the protective systems mentioned by the author, reliance for the operation of the clearing circuit breakers had to be placed upon current transformers, and he found that trouble with current transformers was occasionally experienced during lightning storms, so that they could not be considered infallible. He could recommend the use of high steel poles, because wilful breakage of insulators was avoided; it was practically impossible to break an insulator on such a pole except by using a rifle. His experience had been that the proportion of breakdowns on overhead lines was no greater than with underground cables, and certainly for quickness and ease of repair, overhead lines were to be preferred.

In reply, Mr. Beard said that in several large towns extensive networks were being divided into sections fed from different sub-stations; on the North-East Coast, no extensions were being made to D.C. networks or to rotary sub-stations. The large number of generating stations was due to the existence of sources of waste heat, but for which the area would have been supplied from not more than three power stations. If a waste-heat station failed, the local supply was derived from the main system, and the loss in generating capacity could be made up by the spare plant at the coal-fired stations. In the event of waste-heat stations being shut down by a strike, there would usually be a corresponding drop in the load on the system. The same trouble had been experienced with birds in the North as in South Wales, and recent lines were being carried on suspension insulators. Sometimes a flock of birds might settle on a particular wire, and increase the sag so much that the wire or a bird on it comes into contact with the wire of another phase. Wayleaves were required for high-pressure overhead lines, because these could not be erected along a public road: underground cables, on the other hand, could be laid in public roads without any wayleave. The choice of frequency depended mainly upon the plant and consumers' apparatus, and had little to do with the distribution system. On the N.E. Coast system two years ago the output exceeded one million units a day, but owing to the high load factor the maximum demand had not yet reached 100,000 KW. The units generated by the waste-heat stations were about one quarter of the total. Surge effects did not cause much trouble on a large system, and the less apparatus they had for protecting against surges, the less trouble they experienced. For the overhead lines, they relied entirely on taking them into sub-stations through a short length of underground cable, which device had proved strikingly successful. All metal parts of switchgear that were not alive were earthed. The split-conductor system was the best to deal with breakages on overhead lines, which were otherwise very difficult faults, owing to the resistance of a broken wire to earth being sometimes from 50 to 100 ohms. Where cables had already been laid, the balanced-current system could only be applied by laying pilot cables; but when converting an old radial system into an interconnected one, it was better to group the old feeders in pairs and treat the double cable as a single split-conductor feeder.

WAR ITEMS.

German Engineering Industry.—Herr Fröhlich, the secretary of the Association of German Engineering Works, recently addressed a gathering of engineers in Würtemberg on "Industry and the War." There was, he said, no scarcity of the two most important raw materials, coal and iron, and the present production of pig-iron and steel exceeded the requirements of the Empire. Although the commandeering of metals by the Government had at first caused great difficulties in the engineering industry, these had been overcome, thanks to the adaptability of the works. Economy in the use of high-speed steel was necessary. The home trade had been but little affected by the war, and hardly any contracts had been cancelled; although in some cases execution had been postponed until after the war. Very few new contracts had been placed, but the absence of such was made good by the increased Army orders. As a result of the pressure put upon the industry by the military requirements the German works had acquired an experience in the rapid construction of automatic machines and in turning out machines on a wholesale scale which must have a beneficial effect upon the whole industry. The months of war were months of learning which would lay the foundation of future technical progress. The export trade had suffered greatly, for it must be remembered that in normal times about one-third of the total output of the German engineering works was exported. After the war neutral countries would probably act to a great extent as intermediaries in introducing German goods in what were now enemy countries.—"Ironmonger."

Bolton Corporation and its Contracts.—At the monthly meeting of the Bolton T.C., on February 2nd, information was sought as to whether the firm of Messrs. Falk, Stadelmann & Co., Ltd., to whom moneys had been paid by the Electricity Committee for fittings, and by the Gas Committee for mantles, was a British firm. Councillor J. H. Crook said the capital of the company named was £392,790, all the directors were British subjects, as also were the shareholders, with one exception. The firm traded with various Government departments, and no fewer than one hundred of its employés were serving with the Forces.—Councillor Haythornthwaite (who originally raised the subject) said that the last speaker was misinformed, or else he himself was misinformed. According to a document issued by the Companies Registration Office in November, this company was registered in October, 1913. The total capital was £392,790, of which £78,447 was held by two German subjects in Germany, £2,200 by a German subject in this country, £190,721 by three naturalised subjects of German origin, whilst the remaining £95,470 was held by the wife and daughters of a German member of the firm, a naturalised German. It was up to the Corporation committees to see that they did not have German goods foisted upon them.—The Mayor (Alderman Seddon) said there was a difference between two members, and he thought the Council might leave the matter with the two, along with himself, to see which of the statements was correct.—It was decided that the subject should be inquired into in this way.

Coal Supplies.—The Board of Trade announces that owing to the increasing demands of industries connected with the war, the difficulties with regard to fuel supplies to which the Board called attention on December 1st last have become more pressing in certain districts. It was decided, therefore, to appoint, on the nomination of the various coal-owners' associations, district coal and coke supplies committees, with the object of ensuring that munition firms and other important consumers obtain the supplies they need with as little delay and friction as possible. Committees have been formed, or are in course of formation, in many districts. It will be the business of these committees to see that the resources of their districts are utilised to the best advantage, and that the requirements of important industries are fully met. Any recommendations that they may be able to make with a view to greater economy in the use of coal will be carefully considered.

"Re-fitting" Wounded Soldiers.—In connection with the work of "re-fitting" wounded soldiers for industrial employment—a subject to which great attention is being paid in Germany—an exhibition of artificial limbs has just been opened in Charlottenburg. Not only are the exhibits numerous, but they show that marvellous progress has been made in providing men who, in the war, have suffered the loss of arms or legs, with artificial limbs that will not only enable them to perform ordinary duties but to follow their old employment.

A New German Price Advance for Machinery.—The leading firms in Germany belonging to the price convention for heavy electrical engineering manufactures, have just made a further increase of 10 per cent. in the list prices owing to the present situation of the market for raw materials, thus making a total advance of 40 per cent. The higher charges apply to machines and motors, including electrically-driven ventilators, pumps, boring machines, etc., starting appliances, regulating resistances, controllers, oil, lever and automatic switches, and railway materials, whilst the list prices for machines and motors of over 100 h.p., as well as for transformers, continue suspended. Further increases are reserved in the case of articles for purely peace services. Among the firms who have signed the circular announcing the alteration are the A.E.G., Siemens-Schuckert, Bergmann, and Brown-Boveri.

Women as Engineers.—Speaking on "Women's Work during and after the War," at a meeting of the Royal Society of Arts, Lady Parsons said that a new field for women's enterprise seemed likely to develop in the important industrial profession of engineering. It would be a great advantage if provision could be made for some educated girls to go through the shops and gradually take control of unskilled women-workers. If a favourable apportunity were to arise for establishing a factory for women it would be a great step towards organising all our resources. She suggested that women might specialise on making some of the innumerable articles that we bought from Germany before the war, such as motor-cars, cycles and parts, electrical machinery, sewing machines, cheap clocks and watches. It was clearly a case for the Government to give a lead.—"Times."

After the War.—The Lambeth and Battersea B.C. have passed the following resolution, copies of which have been sent to the Government, the members of Parliament for the boroughs, and Metropolitan B.C.'s:—"That the time has arrived for legislation to be framed to protect our people against the return of trading aliens after the war; that such legislation should take the form of licensing all professional and trading concerns."

Glasgow Corporation and Enemy Contracts.—The Special Committee on Standing Orders recommends the Glasgow Corporation to resolve:—"That during the period of the war no contract be entered into with any person of German or Austrian nationality; or with any firm or company whose subscribed capital (whether by way of shares or otherwise) is held or controlled to the extent of one-third or upwards by persons of German or Austrian nationality."

Australia and Enemy Shareholders.—Reuter's Melbourne representative states that the regulations approved by the Federal Executive for the wiping out of enemy and naturalised shareholders in public companies, and making the transfer of their shares to the Public Trustee until a year after the war obligatory, also apply to persons on the London registers of Australian companies.

Excess Profits.—All applications or appeals respecting the excess profits duty should be sent to the Registrar, Board of Referees (Finance (No. 2) Act), Refuge Assurance Building, 133, Strand, W.C.

Controlled Works.—There are now 2,720 establishments controlled by the Minister of Munitions.

LEGAL.

Postmaster-General *v.* Hutchings.

Mr. Justice Lush, the Hon. Gathorne Hardy, and Sir Jas. Woodhouse, sitting as the Railway and Canal Commission on Monday, February 7th, had before them a case in which Mr. A. B. Hutchings, the respondent, as the owner of an estate at Seaford, in Sussex, which was laid out for building purposes and intersected with roads not yet built upon, sought to uphold a decision of the local County Court judge that the Postmaster-General should pay him £5 a year for the privilege of placing telephone poles on certain portions of the roads, a decision to which the Postmaster-General objected.

Mr. H. L. Murphy appeared for the Postmaster-General, and the respondent appeared in person.

Mr. Murphy said that the matter came before the Court by way of a reference under Sec. 4 of the Telegraphs Act of 1878.

Mr. Justice Lush, in giving judgment, said the question had been raised as to whether the roads were private or public within the meaning of the Act, and, in the opinion of the Court, it was quite clear that they were public roads, and had been used by the public for some 15 or 16 years. Being public roads not taken over by the local authorities, Mr. Hutchings was still the owner of the soil, and was, therefore, a person who, within the meaning of the Telegraphs Act of 1878, was entitled to withhold his consent to the placing of poles on the roads. The Postmaster-General desiring to place telephone poles on the road, and to place the wires under the streets, application was made to Mr. Hutchings for his consent, which he did not give, and differences had arisen between the parties. Under Sec. 4 of the Telegraphs Act of 1878 these differences were referred to the County Court Judge for him to say whether the consent ought to be given, and, if so, under what conditions. The Judge thought that the consent ought to be given upon the terms that Mr. Hutchings should receive a rental of £5 a year. The Postmaster-General was dissatisfied with that decision, and the matter came before that Court in consequence. It was clear that in dealing with the application they must regard Mr. Hutchings not in his capacity as owner of the adjoining land, but as the owner of the soil of any roads dedicated to the public. If Mr. Hutchings should suffer any damage as the owner of the land, the Act provided in clear terms for his compensation. It was a very unusual thing for a County Court Judge to say that a rental should be paid to the owner of a street. It appeared to the Court that it was inconsistent that he should be given a rental for that which did not affect his proprietary interest. There was no ground for saying that the Postmaster-General should pay a rental to the owner of the soil of the public road. If Mr. Hutchings could show that in his capacity of owner of the soil of the roads he would be put to any expense or damage it would be right to safeguard him. The Postmaster-General, however, would make good any damage, so that Mr. Hutchings would suffer no pecuniary damage whatever by the erection of the poles. Every possible provision would be made by the Postmaster-General to safeguard Mr. Hutchings against having his roads made unsightly. The Court, therefore, had come to the conclusion that the condition imposed by the learned County Court judge ought never to have been imposed, and that the Postmaster-General ought to be relieved from it and consent given to the application.

Sub station Attendants.

A case of interest to central station managers and employés was brought before the Local Munitions Tribunal for the Metropolitan District at Caxton House on the 3rd inst., at the instance of W. J. Ebben, who complained that the consent of the Poplar Electricity Department to his leaving its employ was unreasonably withheld. The complainant stated that he wished to leave because he was at present engaged on work which did not utilise his engineering skill and his training as a skilled mechanic to the full; he was only required to work 48 hours a week, and an improver was doing the same work for 30s. a week.

Mr. J. H. Bowden, electrical engineer to the Borough Council, pointed out that the improver would eventually have the same status as the complainant, but was not yet sufficiently qualified to be placed in full charge of the work; 48 hours was the usual week in that class of work, for which no special skill was required.

After hearing the evidence of Mr. Bowden, the Court unanimously decided that the certificate of release asked for could not be granted. By this decision, the electricity supply undertaking appears to be placed on the same basis as a controlled establishment.

Threat to Cut off Supply at West Bromwich.

On February 4th, in the Chancery Division, Mr. Justice Eve heard a further motion in an action against the Corporation of West Bromwich, in which the plaintiff asks for an injunction to restrain the defendant Corporation from cutting off electrical energy with which he alleges they contracted to supply him.—Counsel said the motion would have to stand over for a short time, and the Corporation had agreed to abide by the undertaking they had given until the dispute was decided.—His Lordship assented.

Telegraphists' Cramp.

At the Marylebone County Court, a widow claimed £300 compensation for the death of her daughter, due, it was said, to telegraphists' cramp, set up while employed as a telegraph operator in the Government service. It was contended that the cramp set up sclerosis which affected a central portion of the brain and spread through the nervous system with fatal results. After hearing medical evidence, the judge held that the connection between the sclerosis and cramp was a surmise. He made his award in favour of the respondent, the Postmaster-General.

Coal Mines Act Prosecution.

In the Hamilton Sheriff Court last week, Sheriff Shennan heard lengthy evidence in two charges of alleged contravention of the Coal Mines Act brought against R. Hutchison and A. Shaw, firemen. The prosecutions were the sequel to a fatal accident which occurred in the Bardykes Colliery, Blantyre, last August, and the complaint bore that a fall of stones, &c., having taken place, and an unarmoured electric cable having been brought down and covered by the *débris*, the accused negligently and wilfully asked and allowed several workmen to clear away the fall while the cable was still alive, whereby the lives of the men were endangered, and one of them, McDougall, miner, made contact with the cable and was killed. Witnesses for the Crown deposed that the firemen warned the men to be careful in clearing the fall as the current had not been switched off. On numerous occasions, *débris* had been cleared from a cable while the current remained on.

Mr. William Smith, head electrician to the Summerlie Iron Co., said that the coal-cutter was working at a pressure of 500 volts.

As a matter of practice the current was not switched off when a fall took place. It would impede the work of the pit, if, after a fall, the current was switched off, as electricity was used for ventilation and pumping purposes.

Sheriff Shennan said that as one or two rather important points of law were involved in the prosecutions, he would take time to prepare a written judgment.

Herbert Morris, Ltd., *v* Saxelby.

The House of Lords delivered its judgment in this appeal on Monday. The matter has been fully reported in our pages on several occasions. Their Lordships dismissed the firm's appeal.

BUSINESS NOTES.

Consular Notes.—JAPAN.—The British Consul, in reporting on the trade of Nagasaki, gives the figures for the machinery import trade during 1914. He shows that though the import from the United Kingdom was less under most headings than in 1913, it was still far ahead of the imports from all other countries combined. The largest part of the import was for the local shipbuilding yard. The totals for the United Kingdom were £101,469 in 1914, and £167,378 in 1913; Germany's total was £21,660 in 1914 and £25,833 in 1913; and the United States share was £7,868 in 1914 and £10,114 in 1913. The following are the figures for some of the different classes:—

	United Kingdom.	Germany.	United States.
Steam boilers	£9,419	—	£148
„ turbines	2,968	1,558	—
Electrical machinery ...	2,946	4,931	1,694
Pumps	3,110	1,493	159
Capstan and other winding machinery	5,784	799	455
Metal or wood-working machinery	21,064	—	1,094

Compared with 1913, the items showing a decrease from the United Kingdom were pumps, cranes, electrical machinery and gas, petroleum and hot air engines. Germany had an increase in electrical machinery, but a decrease in steam boilers and turbines, pumps, metal and wood-working machinery, gas, petroleum and hot air engines. From the United States the decrease was chiefly in electrical machinery.

The Mitsu Bishi Dockyard and Engine Works employed 10,445 workmen at the end of 1914. The Consul says that in mild steel bars and plates the United Kingdom makes no effort to compete, but as it is now impossible to obtain these from Belgium or Germany, there may be an increased demand for a better class of steel. The steel foundry at Wakamatsu now produces large quantities of iron plates for dockyard and other uses. Work on the construction of an electric tramway system for Nagasaki was to be begun last year. "A portion of about two miles will be first undertaken, and so far as can be learned, the promoters are buying the rails second-hand and the cars are to be made in Japan."

CHINA.—British Consul General Goffe, in his report on the trade of Mengtzu, says:—"The great drawback to British trade in this province hitherto has been the lack of any British house to represent British manufacturers and push the sale of their goods; but there is a good prospect of this deficiency being remedied in the near future. The present moment is exceptionally favourable for such an enterprise, as the two German firms of Carlowitz and Co. and Speidel & Co., who have hitherto supplied local buyers with machinery, piece-goods, dyes, paper, &c., can now obtain no further supplies, and the Chinese would welcome the establishment of a British house here. There are inquiries for irrigation pumps, electric light machinery, flour and rice mills, the installation of waterworks in Yunnanfu, locomotives and trucks for the Pishih-chai Railway and other items, but they can only be dealt with by a man on the spot who is prepared to make a contract for the goods delivered c.i.f. at Haiphong, to assist possibly to some extent in their erection and to arrange the question of exchange. The representative of the machinery department of a Hong-Kong house is now in the province looking into these matters, and there is a good prospect of at least some of the inquiries resulting in the placing of orders with British manufacturers."

INDIA.—The American Consul at Karachi, in reporting a request by a firm in that town to be placed in communication with American manufacturers of small engines capable of being driven by electricity, to develop about 5 H.P., and to be as simple as possible in construction, states that this firm, if satisfied, is prepared to push such engines up-country. In India the lower and middle classes do not, as a rule, leave their homes or the districts in which they were born; but the members of enormous "families" live close together in "groups" which combine to buy a machine to grind meal. Sometimes this small mill is run by an oil engine, but recently electricity has made great strides in India and the natives are learning to use it. The local electrical works recently advertised to supply not only electroity for lighting, but also power for mechanical purposes. The firm mentioned above sees a future for small engines run by power furnished by the electrical works. Several of these engines are, as a matter of fact, in use for the purpose mentioned, and as these machines are not kept in stock, the supply must come from abroad. A complaint is made that on a previous occasion American manufacturers, when advised of the prospective market in Karachi for electrical goods some time ago, "went to sleep" and now an English firm is wiring the town and supplying all the bulbs and other fixtures.

CUBA.—Modern automatic telephone systems, with complete underground cables, are now, states a report by the American Consul at Santiago de Cuba, in operation in that and many other Cuban cities. The old magneto system, formerly in use and very unsatisfactory, has been changed throughout the island. Long-distance service is furnished to nearly all the cities and large sugar mills. The Cuban Telephone Co., an American concern which obtained its concession in 1909, owns and operates practically all the local and long-distance lines in Cuba. New central offices have been constructed in Santiago and the new switchboard now being installed is for 2,000 lines.

ITALY.—There has been, according to an American Consular report on trade in Italy, considerable increase in activity with regard to electrical goods in some districts of that country. At Bari, in recent years an important business has been done in all kinds of electrical appliances, especially motors for industrial and agricultural purposes, electric light and power plants, &c. The greater part thereof was supplied by German firms, who were specially organised for this class of work, having their own branches in Italy. They were thus in a position to furnish complete plants, and if repairs were required their engineers and workmen were near at hand, all of which gave them an unquestionable advantage over their competitors. However, the present war will undoubtedly be the cause of a considerable set-back to German trade in Italy and an interesting field for enterprise will be thus opened to other competitors. In the region of Pisa—a most flourishing industrial section, largely connected with the manufacture of alimentary products, there are more than 200 mills for the grinding of cereals, most of which use water power. The use of small electric motors of 1½ to 3 H.P., is, however, becoming more extensive, and a few of the larger plants have installed motors of 20 to 45 H.P.; but there are more than 300 olive-oil factories where the power used for pressing the olives is still largly hydraulic or animal.

TUNIS.—A recent American Commerce report draws attention to the increasing possibilities of this African market. Tunis is a rapidly growing country of great agricultural and mining resources with a population of about 2,000,000. An increasing market is being developed for all kinds of manufactured goods, and progressive methods are everywhere manifest. Increasing production has brought increasing prosperity, with its demand for a great variety of goods other than farming and mining machinery. The efficient government under the French protectorate has also raised the standard of living of the natives and stimulated their purchases of modern goods. Amongst other things, electrical goods offer a field for future development. There has been a considerable volume of German and Austrian trade, prior to the war, and the latter government has had a commercial museum in Tunis.

SOUTH AMERICA.—Evidence continues to accumulate that the American traders, despite the exceptionally favourable opportunity presented as a result of the temporary withdrawal of many European firms from South American markets as a result of the war, are not carrying all before them in their attempts to capture these valuable markets. The American Consul at Pernambuco, who has been conducting a series of interviews with business men of that city with reference to American trade, corroborates the statements of his colleague at Buenos Ayres, to which reference was made in our issue of January 7th last. Complaint is made of the carelessness of many firms whose indiscretions cause all the trade to pass through the hands of a few firms in New York and thus make it almost impossible for manufacturers and exporters, launching into foreign trade for the first time, to enter these markets, although they are well equipped with managers who know how to deal with the South American importer. These latter firms are not given a fair chance, as the merchants in Pernambuco are, as a result, afraid to deal with unknown firms.

A well-known merchant of that city remarked: "I have seen a great many letters from American firms that wanted to do business in this city, but I never considered them." When asked why, by the Consul, he replied: "Because your good firms have enough business to attend to at home. Only those that cannot sell their products at home want to find foreign markets." Several instances which have contributed to this unfavourable impression are quoted. The question of credit is also again referred to as a stumbling block to the increase of American trade. Traders still continue to demand cash against documents in Pernambuco, or even in the United States, before the delivery of goods. "If we have to pay cash," local merchants say in discussing this question, "we will buy only what we have to, and hope to do business with Europe again after the close of the war. We have a good reason for this. We must do business on credit. Here in Pernambuco most of our business is with the interior and we have to sell to our customers on credit. Another reason is the excessive Customs charges, which would surprise some of the American manufacturers. Then comes the value of the stock itself, so that to pay cash really means working with three capitals—one for the customers, one for the Custom house, and one for the American exporter." The Consul urges that longer credit should be given and also that more care should be taken in dealing with orders. He even suggests that manufacturers should pass a resolution, promising more careful attention, which could be circulated amongst local traders.

Book Notices.—*Flood Control in California.*—We have received a copy of the report made by the Board of Engineers of Flood Control to the Supervisors of Los Angeles County, relative to an investigation made by this Board, which was appointed in April, 1914, and included the well-known engineers, Messrs. Frank H. Olmsted and J. W. Reagan. The book contains about 500 pages with complete and detailed maps and drawings. This Commission spent 18 months and about one hundred thousand dollars in making surveys and gathering data relative to both the prevention and control of the great floods which every decade visit Los Angeles County. The cost of the works recommended is estimated at more than 16 million dollars. Copies of this report may be secured by professional men, and the authorities of localities having similar flood problems, by addressing the Board of Supervisors of Los Angeles County, Los Angeles, California, or J. W. Reagan, Chief Engineer of Flood Control, Hall of Records, Los Angeles, California.

"*Journal* of the Röntgen Society." Vol. XII, No. 46. January, 1916. London: Smith & Ebbs, Ltd. Price 4s. net.

"Technical Papers of the Bureau of Standards." No. 26: "Earth Resistance and its Relation to Electrolysis of Underground Structures." No. 52: "Electrolysis and its Mitigation." No. 56: "Protection of Life and Property against Lightning." "Scientific Paper of the Bureau of Standards." No. 259: "A new relation derived from Planck's Law." Washington: Government Printing Office.

"*Transactions* of the North-East Coast Institution of Engineers and Shipbuilders." Vol. XXXII, Part 3. January, 1916. Newcastle: The Institution. Price 6s.

Messrs. Hodge & Co., publishers, have in the Press, and will shortly issue for the use of employers and workmen, a handbook on the Munitions of War Acts.

"Examinations in Science and Technology, 1915." London: Eyre & Spottiswoode. Price 9d.

Staff Supper.—The Supply Department of the British Westinghouse Electric and Manufacturing Co., Ltd., held their annual hot-pot supper and smoking concert on January 21st, at the Exchange Hotel, Manchester, when 32 members of the staff and friends sat down to supper. At the smoking concert which followed, Mr. J. Gibson, manager of the department, presided, and he was supported by Mr. G. Ellam (assistant manager). Over 50 were present, including visitors and the department's representatives from Leeds and Sheffield. Mr. Gibson, in giving the toast "The British Westinghouse Co.," referred to the loyal feeling which existed between the company and the staff, and said that during the nine and a-half years he had been with the company, they had treated their staff well, and in return the staff loyally carried out their duties. The department had had a record year, the turnover having increased by nearly 70 per cent. There were many faces missing that night—some, unfortunately, would never be with them again, but he hoped that others who had answered the country's call would be spared to be with them again. Mr. Ellam proposed "Our Visitors," and Mr. L. E. Wilson and Mr. E. E. Prestwich responded. Mr. Bent toasted "The Artistes," and Mr. Moon responded.

Private Arrangement.—The Cedes Electric Traction Co., Ltd, 112, Great Portland Street, London, W.—A conference of the principal creditors was held on January 31st, at the Institute of Chartered Accountants. A statement of affairs prepared by Messrs. J. W. Barratt & Co. showed unsecured liabilities of £7,271, while the assets were estimated to realise £5,302. There had to be deducted £255 for preferential claims and £4,090 due on debentures, and the net assets were reduced to £957. Mr. J. W. Barratt was appointed receiver and manager on January 14th last upon the application of the debenture holders, who were the Austrian Daimler Motor Co., Ltd. The company had carried on numerous contracts, on some of which money had been lost. At the present time they held a Government contract, which it was believed was profitable, and was being continued by the receiver. It was pointed out that in addition to the assets shown on the statement of affairs, there was a large amount due in connection with a sub-contract, and in certain quarters it was thought that a large sum would be realised. There was also the profit which it was expected would be made on the Government contract. There was a large creditor for over £39,000 for money lent, but that amount also was not included in the statement. It appeared that the money was lent by the Disconto Gesellschaft, but there was some doubt as to whether the claim would rank. It was not certain whether the firm named were the actual principals, and it might be that the money came from the Skoda Works, Austria. The company's business was being controlled by a Government supervisor. A petition had been filed for the winding-up of the company. After some discussion it was decided to appoint a Committee of the principal creditors to consider, in conjunction with the company's solicitor, and the receiver, a scheme by which second debentures could be given to a trustee for the benefit of the unsecured creditors. The Committee appointed consisted of the representative of Messrs. Johnson & Phillips, Mr. Hawkins, and Mr. P. Houston (Messrs. Corfield & Cripwell).

Prices Advance.—The St. Helens Cable and Rubber Co., Ltd., announce increased prices for rubber-insulated wires and cables consequent upon the continued advance in cost of raw materials.

For Sale.—The Dundee Electricity Supply Department has for disposal one 30-kw. generating set, direct-coupled to 200-250-volt "Parker" D.C. dynamo, complete. See our advertisement pages to-day.

Bankruptcy Proceedings.—C. H. Leibbrand, 20, Vesta Road, Brockley, author.—The first meeting of creditors was held on Monday at the London Bankruptcy Court. The receiving order was made on January 26th, on the petition of the Capital and Counties Bank, Ltd., who tendered a proof of debt for £317 in respect of an overdrawn balance at their Felixstowe branch. Mr. F. T. Garton, Official Receiver, reported that the debtor had stated that he was a German by birth, but was de-nationalised in November, 1884, and domiciled in France in 1887-8. He was an author, but had also been engaged in the promotion of companies, though he had never promoted one in his own name. Since 1913 he had been working on a big electrical development scheme at Felixstowe for supplying electricity to East Suffolk. He was the promoter, and had expended at least £3,000 on the scheme, which had been suspended in consequence of the war. He was taken to the Alexandra Palace Detention Camp on November 17th, 1915, without warning, through his not being registered as an alien enemy, although admittedly an ally by right of domicile in France. A previous failure was recorded against the debtor in September, 1902, under which proceedings a dividend of 4½d. in the £ was paid, and from which he had been discharged. He attributed his present position entirely to the war, which stopped all his schemes and business. Debtor sent a letter asking for an adjournment with a view to submitting a proposal. The Chairman said that the debtor had not lodged a statement of his affairs. In his preliminary examination he stated that he was only legally liable to the extent of about £600, and he had in the shape of assets, book debts, amounting to £9,000. In the absence of a quorum the meeting was adjourned for a fortnight.

Augustine Garbutt, tobacconist and electrical engineer, Bradford.—At the public examination at Leeds, on February 1st, it was stated that the liabilities were £146 and the assets nil. Debtor attributed his failure to keen competition and losses on contracts. The examination was adjourned until February 15th.

Liquidations.—Scientific Manufactures, Ltd.—Meeting of creditors, February 14th, at 3, Warwick Court, Gray's Inn, W.C.

Accumulator Industries, Ltd.—Creditors should send particulars of debts, &c., to Mr. G. E. Corfield, Balfour House, E.C., or Mr. A. W. Sully, the liquidators, by March 8th.

Adnil Electric Co., Ltd.—First meeting of creditors and contributories, February 29th, at Carey Street, W.C.

Cicoy Magneto Co., Ltd.—A meeting is called for March 13th, to hear an account of the winding up.

Hele-Shaw Patent Clutch Co., Ltd.—A meeting is called for March 8th, at Hartford Works, Oldham, to hear an account of the winding up.

Inquiries from Italy.—The British Chamber of Commerce for Italy at Genoa sends the following inquiries from firms who formerly did business with Germany and Austria and want to establish British connections:—

No. 956.—Firm at Bari inquire for addresses of British manufacturers of electric material. B.F.R.

No. 969.—Merchant at Turin wishes to get into touch with first-class manufacturer of high-speed steel. T.M.C.

No. 987.—Commission merchant at Genoa is open to represent British firms for mechanical machinery, machine-tools, hydraulic machinery, metals and ores, paints and varnishes, oils. G.M.A.

Trade Announcements.—Messrs. Parmiter, Hope and Sugden, Ltd, have appointed Mr. David Alexander, 43, Mains Street, Waterloo Street, Glasgow, their sole selling agent for Scotland. At that address samples will be shown of all their latest Fluvent switch and fuse gear.

The Indo-European Telegraph Co., Ltd., (Globe Radio Apparatus Department) announce that it has been found more convenient to designate by that title the business of the Wilson Apparatus Co. recently taken over from Mr. H. R. Rivers-Moore. All communications should be addressed accordingly.

Diesel Engine Insurance.—We have received from Messrs. Mirrlees, Bickerton & Day, Ltd., of Hazel Grove, near Stockport, a prospectus of a new scheme of insurance of Diesel engines of their make (under arrangement with the London, Guarantee and Accident Co.), which provides for periodical inspection and examination by the firm's own experts. Those interested in the matter should communicate with the firm, asking for a copy.

Patent Restoration.—Application has been made by Nathaniel Baldwin for the restoration of Patent No. 10,774, of 1910, for "Improvements in sound reproducing devices of the telephone receiver type."

An order has been made restoring Patent No. 21,425, of 1911 (R. B. Wasson), for "Improvements in and relating to the manufacture of metal-packing rings."

Meeting of Creditors.—Empire Portland Cement Co., Ltd.—The committee of creditors, appointed at the general private meeting of creditors, reported last week that a tentative offer had been made to purchase the company, and it was hoped that the sale would produce about 5s. in the £ for the creditors.

Lamp Poster.—The "Z" Electric Lamp Manufacturing Co., Ltd., of Southfields, have brought out a new poster advertising the lasting qualities of their drawn lamps, and a window streamer emphasising that they are made in England.

LIGHTING AND POWER NOTES.

Aberdeen.—New Plant.—The Electricity Committee has approved of an extension of plant at sub-stations, and has authorised the engineer to procure a 500-kw. motor-converter, at a cost of £1,800.

Argentina.—The electrical power house of Messrs. Barone & Hamsa, at Concepcion del Tio (Cordoba) for the supply of public lighting was inaugurated on 1st inst. The service is shortly to be extended to private houses and business premises.—*Review of the River Plate.*

Barnet.—Street Lighting.—The North Metropolitan E.P.S. Co. has allowed the District Council a sum of £66 off the account for public lighting during the past quarter.

Barrow.—Proposed Loan.—The T.C. has decided to apply for sanction to borrow £10,300 for electricity extensions, including transforming plant, cables, switches, &c., required for power purposes, and for supplying light to workmen's dwellings.

Birkenhead.—Proposed Loan.—The provision of H.T. plant and feeders in connection with the supply to the north end of the borough is recommended, at a cost of £6,400.

Birmingham.—Proposed Revision of Charges.—The Electricity Committee is proposing to increase the charges for electricity; it is expected that the Committee will be in a position to make recommendations to the City Council in March.

Coal Contracts.—The City Gas and Electric Supply Committees have decided to pool their coal contracts in future, instead of purchasing independently.

Bo'ness.—The T.C. has instructed Mr. J. M. M. Munro, of Glasgow, to report on the condition and prospects of the electric supply undertaking, and the need for an immediate extension.

Bredbury and Romiley.—The Stockport T.C. is negotiating with the U.D.C. for consent to current being supplied to Messrs. Pollock & Macnab's works.

Derby.—The T.C. has decided to extend the overhead mains so as to supply current to the works of the Parker Foundry Co.

Dover.—Public Lighting.—Owing to the restricted public lighting, there has been a loss on the capital spent on cables and time switches, and the Electricity Committee has allowed the T.C. credit for this, and to pay £150 a year for the clock switches after March 31st.

Downham Market.—E.L. Scheme.—Mr. C. H. Best has written to the U.D.C. regarding the offer of the Gas Co. to obtain powers to supply electricity, pointing out that an undesirable monopoly would be created, and that far greater satisfaction would be given by an independent supply company which he proposed to form. The Council has decided to discuss the matter with Mr. Best.

Dublin.—A comprehensive report has been submitted to the Special Investigation Committee of the Corporation by Mr. P. W. d'Alton, M.Inst.C.E., who was appointed by the Committee to inquire into the history and conduct of the electricity supply undertaking of the Corporation. By some means parts of the report were prematurely published in the local Press, and complaints were made at a meeting of the Council that the extracts were so chosen as to give an erroneous impression regarding the trend of the report. We shall deal with the report in our next issue.

Eastbourne.—The Electricity Committee has disclaimed legal liability in regard to the recent fatal collision with a switch pillar; the switchbox was placed in its position in accordance with the B. of T. regulations.

Eccles.—Plant Extensions.—The electrical engineer is to report on the cost of providing a plant for three-phase supply, with a view to application being made for borrowing powers to carry out the scheme.

Large users of electricity for lighting purposes are now to be charged a flat rate of 3d. per unit for a consumption exceeding 10,000 units per annum through one service, subject to 10 per cent. increase.

Gillingham (Kent).—The T.C. has decided to increase the charge for current supplied to the Corporation flats from 6d. to 8d. per week. Owing to the difficulty of obtaining supplies of reliable apparatus no more electric cookers are to be issued until a hire-purchase scheme is introduced after the war, and the existing outfits are to be maintained as at present.

Glasgow.—New Plant.—In connection with the placing of contracts for two 8,000-H.P. turbo-alternators, it has been officially pointed out that the Electricity Committee had only maintained the supply by overloading the existing plant. Three large factories, still to be connected, would absorb nearly the whole of the output of one of the turbines, and the other turbine would be required to meet the normal increase at the rate of 2,000 new consumers per annum. The two new sets would effect a saving in fuel equivalent to about £5,000 per annum each, a most desirable form of economy at the present time.

Horsham.—Year's Working.—The report of Mr. Morgan, the Council's electrical engineer, shows that despite adverse circumstances, there was a net profit on the electrical undertaking of £420 for the year to March, 1915, as compared with £459 for the previous year. Returns are included of the first complete year's working of the refuse destructor, showing that some 1,422 tons were burnt and 106,690 units generated during 2,458 running hours. The destructor is credited with 320 tons of coal saved and revenue from by-products, totalling £384; financial charges, labour, &c., amounted to £260, leaving a credit balance of £124.

Leek.—The U.D.C. has decided to engage Dr. Watkinson, of Liverpool University, to inspect the electricity works and report. There has been a breakdown of the Diesel engine, the crankshaft of which is cracked, and cannot readily be replaced.

Leigh.—Plant Extension.—Authority has been given to the electrical engineer to obtain tenders amounting to £18,800 for the supply and erection of additional plant.

Limerick.—The Mayor recently officially started up a new 240-H.P. generating set at the electricity works.

London.—The London Electric Supply Corporation, Ltd., has announced a further 10 per cent. increase in its charges for energy as from March.

Hackney.—The E.L. Committee recommends that the charges for electricity be increased by 17½ per cent., as compared with the scale of July, 1914; a 2½ per cent. discount will be allowed for payment within 14 days.

L.C.C.—Sanction is to be given to the borrowing of £13,000 by St. Pancras B.C., and £3,290 by Woolwich B.C. for electricity purposes.

The L.G.B. has been notified of approval of the linking-up schemes of the Woolwich B.C. and South Metropolitan Electric Light and Power Co.; of Marylebone B.C., the Central Electric Supply Co. and the Metropolitan Electric Supply Co.; and of the Hackney and Poplar B.C.'s.

The Metropolitan Asylums Board proposes to enter into a new agreement with the Charing Cross E.S. Co. for supply to the head offices; electric light is also to be installed at the Mead ambulance station.

Owing to the bursting of the compressor of a Diesel engine at the generating station of the Smithfield Market Electric Supply Co. on Monday, one man was so badly injured that he died soon afterwards; the station was only slightly damaged.

Manchester.—Motor Hiring, &c.—It is proposed to spend £40,000 on hired motors and additional plant at sub-stations; the revenue obtainable is estimated at £6,400 per annum. It is also proposed to increase hire charges for electric motors by about 20 per cent., representing £1,896 per annum. The increase will date from June 24th next. The Gas Committee has arranged for a supply of electricity to the Bradford Road works, for a period of seven years.

Newmill.—E.L. Scheme.—The U.D.C. has decided to make inquiries from Holmfirth U.D.C. as to a supply of electricity.

Pembroke (Dublin).—L.G.B. Inquiry.—An inquiry was held on February 2nd, by Mr. P. C. Cowan, into the Council's application for sanction to borrow £15,000 for electrical extensions.

Perth.—Mr. Lambert, the borough electrical engineer, has reported on the electrical appliances at the gasworks, at which there was a serious breakdown recently, and his suggestions are to be carried out as found convenient.

Queenborough.—Price Increase.—The Sheerness and District Electric Power Co. has increased the price of current to consumers by 15 per cent. as from January 1st.

Reigate.—Price Increase.—The T.C. has decided to raise the price of current for heating from 1d. to 1½d. per unit as from April 1st next.

Ripon.—E.L. Scheme.—A small Committee has been appointed to inquire into the question of the delegation of the electric supply powers to a suitable company.

Rugeley.—Prov. Order.—The Gas Co. has informed the U.D.C. that it is in some doubt as to whether the B. of T. will grant it a prov. order for electric lighting.

Salford.—Increased Charges.—The T.C. has decided to advance the increase in price of electricity for lighting and power from 7½ per cent. previously decided upon to 10 per cent. for lighting and 15 per cent. for power. The new rates are to date from April next.

Sheffield.—Mains Extensions.—Mains are to be extended in various parts of the city, at an estimated cost of £4,170, of which £2,150 will be spent in laying mains to the new sub-station in Sidney Street.

Skelton and Brotton.—The U.D.C. has decided to transfer £1,200 from the district account to the electric supply fund to meet the cost of work done outside the contract price for electricity supply.

Southampton.—Plant Extension.—In view of possible difficulties in steam raising, due to the inferior quality of coal in use, the Electricity Committee has directed its engineer to submit a new scheme for conveying plant, but has deferred the question of new boiler plant, which had been raised, until next September.

Swaffham.—E.L. Scheme.—The proposal of Mr. C. H. Best, for an E.L. scheme for the town, to be carried out after the war, has been considered by the U.D.C., which is to interview Mr. Best.

Swansea.—Electricity Showrooms, &c.—The Corporation's new electrical showrooms were officially opened on Friday, last week, by Ald. Sinclair. It is interesting to note that the Mayor was driven to the showrooms in an electric saloon-body car—the first electric car in Wales—placed at his disposal by Messrs. Johnson & Burgess, Ltd. The Electric Lighting and Tramways Committee reports that Lord Jersey has consented to allow an overhead line through his property to the English Crown Spelter Works, on payment of a way-leave of £1 per annum.

Thirsk (Yorks.).—Public Lighting.—The Parish Council has decided to ask the electric lighting contractors for an abatement in respect of the public lighting account, the first instalment (£177) of which is due, on the ground of the restrictions.

Whitstable.—E.L. Scheme.—The U.D.C. has agreed to the offer of the E.L. Co. to accept 35s. per lamp per annum during the period of the war for public lighting. The money will be retained by the Council for past and future advances in connection with the working of the undertaking.

Wimbledon.—Messrs. Handcock & Dykes have been informed, in reply to their letter disputing their client's (the Fixed Price Light Co.'s) liability for payment for transformer losses, that the question must be settled by arbitration.

The assessment of the South-Western Co.'s new generating station, car sheds, and sidings off Durnsford Road, has been reduced to £4,200 gross and £2,800 net value, these figures to remain in force until March 31st, 1917.

Winchester.—The Electricity Committee reports that it may be necessary in the near future to increase the price of current to all consumers.

TRAMWAY and RAILWAY NOTES.

Accrington.—It has been decided to issue through tramway tickets, at existing charges, between Accrington and Blackburn.

Argentina.—The work of electrifying the Argentina Central Railway to the River Tigre has been resumed by the laying of the third rail and power cables.

Barrow.—In view of the curtailed service on Walney Island, the Corporation has agreed to allow the B.E.T. Co. a rebate of £400 per annum, and has also granted the company new licences for running motor-'buses on certain conditions.

Dudley.—Inquest.—The adjourned inquest on the man Evans, killed in the recent tramway accident, was held on Thursday last week. It was admitted that the conductor did not ring the hand bell at starting as required, in order to get a return signal from the driver, and that the latter when he left the car failed to remove the controller handle, as provided in the rules. The jury's verdict imputed gross carelessness to the conductor and censured the driver, and the Coroner committed the conductor for trial at the assizes on a charge of manslaughter.

Gateshead.—Tramway Accident.—On Saturday evening last a car which was ascending Bensham Bank, and had been brought to a standstill, ran backwards despite attempts to apply the brakes; it subsequently left the rails, overturning at a corner and falling on four pedestrians, who were killed, while many of the passengers were also injured.

At an inquest, held on the 8th inst., on the four persons killed, the jury returned a verdict of "Accidental death," adding that the driver of the car—who left the vehicle in order to assist another driver—committed an error of judgment.

Glasgow.—Female Labour.—Success has attended the introduction of women conductors on the Corporation tramway system; already 1,050 women are in charge of cars, while on Sunday 26 women drivers were put on to various routes for the first time. The general manager, Mr. James Dalrymple, is awaiting the approval by the T.C. of women motor drivers before launching a bigger scheme. This course is rendered necessary by so many of the employés having attested under the Derby scheme.

Japan.—According to official statistics, there were at the end of 1913, 914 km. of tramways worked electrically, comprising 1,528 km. of track; there were at that period 413 km. of lines under construction. In 1913 these lines carried 570,000,000 passengers, and the 55 companies which worked them paid dividends amounting to 7·91 per cent. The largest network is the municipal system at Tokio, totalling 242 km.; the second in order is the electric railway company of Kechan, with 108 km. of lines. —*L'Industrie Electrique.*

Leith.—It is recommended, in view of the increased working expenses, to abolish halfpenny fares, workmen's fares in the middle of the day, and the concessions to sailors and soldiers.

Leyton.—Reduced Assessments.—The West Ham Union has agreed to reduce the rateable value of the tramway undertaking from £5,700 to £5,200, and of the electricity undertaking from £5,700 to £4,200, the reduced assessments to remain during the existence of the adverse conditions occasioned by the war.

London.—During the three months ended December last, the Highways Committee of the L.C.C. has settled 1,134 claims in respect of accidents arising in connection with the tramways, the costs amounting to £10,004. In 14 out of 35 other cases verdicts were given against the Council, and £634 and costs had to be paid.

The Local Government Records and Museum Committee of the L.C.C. recommends that it be authorised to settle outstanding questions between the Council and the Assessment Committees of the various B.C.'s regarding the L.C.C. tramway assessments.

Nelson.—Covered Cars.—A Sub-Committee of the Corporation has been authorised to meet representatives of the Colne Corporation, to discuss the advisability of providing covers for all cars.

Newcastle-on-Tyne. — Revenue Estimates, &c.—The tramway estimates for 1916-17 show a gross income of £319,000, as against an expected revenue this year of £324,400; the expenditure is put down at £196 300, as against an expected expenditure this year of £196,175. The gross surplus is estimated at £123.100, and the net surplus at £35,060, but from this is to be deducted £9,600 the cost of allowances to men on active service. This leaves a net profit of £25,460, compared with £33,640 expected this year. During the coming year the estimated expenditure from the reserve and renewals fund is £19,277.

Rotherham.—An offer has been received from the Oldham Corporation to sell a dozen single-deck bogie cars, seating 40 passengers, at £450 each; the Tramways Committee proposes to purchase one, and to ask the Oldham Corporation to keep the offer of the remaining cars open for a period.

Sheffield.—It is proposed to refer the matters in dispute with Rotherham, regarding the running of additional cars to Tinsley, to Mr. Dalrymple as sole arbitrator.

Southampton.—Top-Covered Cars.—The tramway manager has reported on the necessity of providing top-covered cars to avoid overcrowding, and suggests that the Bell Punch Co. be allowed a further 6 per cent. increase on its existing ticket contract. For the year to January 7th last traffic receipts showed an increase of £7,250 and weekly mileage an increase of 1,000 miles.

South-Western Railway Electrification. — It is expected that the Hounslow loop-line electric service will be opened on February 27th.

Stretford.—The D.C. has received a letter from the general manager of the Manchester tramways, detailing certain changes, the effect of which will be to give an improved early morning service in Trafford Park, which will be of great service to employés there.

Wigan.—Referring to the effect of the electricity breakdown upon the tramway undertaking, Ald. Fletcher stated at the T.C., on February 2nd, that the estimated net loss on receipts was £1,277, and the net loss, after deducting power expenses and wages saved, was £956.

TELEGRAPH and TELEPHONE NOTES.

Australasia.—The Pacific Cable Board announces that the deferred and week-end cable services between the United Kingdom and Australasia have been resumed, as from the 4th inst.

Italy.—The Consiglio Superiore dei Telefoni has approved of the reorganisation of the urban telephone network of Rome; extensions of the networks at several other towns, and private negotiation for the supply of 1,500 wall instruments, 1,430 kg. of bronze wire, &c.

Paraguay.—The General Electric Co. has applied for a concession to establish a telephone network at Asuncion, the capital city.

Spain.—According to a notice published in Madrid, a company has submitted a scheme to the Government for the establishment of a public service of wireless telephony in Spain, the Balearic and Canary Islands, and the Spanish possessions in the North of Africa. It is also intended to apply the system of radiotelephony to trains in motion and to the railway system in general.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—April 15th. P.M.G. Common-battery multiple switchboard, or automatic or semi-automatic switchboard, and associated apparatus. See "Official Notices" December 31st.

Brisbane.—April 26th. Deputy P.M.G. Five sections of trunk line switchboard for Toowoomba Exchange. (Schedule No. 342.)*

Melbourne.—April 12th. Electrically operated runway hoist for the Jolimont car shops. Particulars at the contractors' room, Spencer Street.

Sydney.—April 10th. Municipal Council. Supply, laying and maintenance for six months of six 11,000-volt submarine cables, each 400 yards long, across Darling Harbour.*

May 1st. Two 300-kw turbo-alternators, condensers, switchboard, &c., for the pumping station at Ryde, for the Metropolitan Board of Water Supply and Sewerage at Sydney.*

May 3rd. N.S.W. Railways and Tramways Department. One 2,500-kw. turbo-alternator, for Zara Street, Newcastle, power house. Specifications (20s.) from the Engineer's office, 61, Hunter Street, Sydney.*

Bedwas (Mon.).—March 2nd. Electrical goods for the Bedwas Navigation Colliery Co., Ltd. Mr. G. Morgan, Secretary.

Belfast.—February 16th. Corporation. Tramway stores, including cable, lamp and electrical accessories. See "Official Notices" February 4th.

Birkenhead.—March 6th. Corporation. Cable and two rotary converters with switchgear. See "Official Notices" to-day.

Bolton.—March 2nd. Electricity Committee. Twelve months' supply of materials and stores, including some electrical items. See "Official Notices" to-day.

Bradford.—February 14th. B. of G. Maintenance of the electric wiring installation, bells, telephones, &c., at the Union Hospital, Horton Lane. Mr. F. Holland, Architect, 22, Manor Row.

Dewsbury.—Electricity Department. Two second-hand 250-kw. generator panels, oil separator, piping, cables, &c. See "Official Notices" to-day.

Halifax.—February 14th. Corporation. Twelve months' supply of electric lighting fittings and accessories, cables, telephone wire, meters, &c. See "Official Notices" January 21st.

Leigh (Lancs.).—February 18th. Electricity Committee. 2,000-kw. turbo-alternator, 6,600 volts; surface condenser, set of pumps, 1,000-kw. rotary or motor-converter, with switchgear. See "Official Notices" January 28th.

London.—Islington.—February 17th. B. of G. Alteration to wiring, provision of switchboards, motor starters, motors, &c. See "Official Notices" January 28th.

Hammersmith.—February 16th. Corporation. Stores for the Electricity Department. See "Official Notices" February 4th.

Battersea.—February 21st. B.C. Stores for the Electricity Department. See "Official Notices" February 4th.

L.C.C.—The Highways Committee is to invite tenders for tramway fittings, equipment, &c., for 1916-17.

Finsbury.—February 14th. B.C. Six or 12 months' supply of electric lamps. Borough Surveyor, Town Hall.

Metropolitan Water Board.—March 7th. Electric lamps, wire, and accessories. Chief Engineer, Savoy Court, Strand, W.C.

St. Marylebone. February 23rd. B.C. Cables, insulating material, &c.

Macclesfield.—March 15th. Guardians of the Cheshire County Asylum. Electrical goods. Mr. W. G. F. Tingay, Clerk of Asylum.

Manchester.—February 15th. Corporation. Stores for the Tramways Department. See "Official Notices" January 28th.

New Zealand.—Dunedin.—May 17th. City Council. (1) Tramcar bodies; (2) electrical equipment. Plans, &c., from the Town Clerk, Dunedin.*

Portsmouth.—February 15th. Corporation. Six months' supply of tramway stores, including insulating materials, lamps, motor windings. See "Official Notices" February 4th.

Salford.—February 21st. Tramways Committee. General stores. General Manager, 32, Blackfriars Street.

Southampton.—February 19th. Corporation. Stores for the Tramways Department.

Stockton-on-Tees.—February 15th. Electricity Committee. Stores.

Todmorden.—February 12th. Electricity Committee. One Lancashire boiler, superheaters, mechanical stokers, pipework, centrifugal pump. See "Official Notices" February 4th.

Specifications for the items marked * can be seen at the Board of Trade Commercial Intelligence Branch in London.

CLOSED.

Accrington.—Electricity Committee. Altham Colliery Co., for a weekly supply of 70 tons of coal, at 18s. 3d. per ton, delivered, and from March until the winter months, for 30 tons per week extra, for storing, at 16s. 11d. per ton; the Corporation to cart the latter.

Batley.—The E.L. and Tramways Committee. B.I. and Helsby Cables, Ltd. Cable.

Bristol.—The Corporation Docks Committee has accepted the following tenders:—

W. T. Henley's T.W. Co., and Callender's Cable Co.—Cable.
Simplex Conduits.—Conduit and fittings.
Dorman & Smith, Ltd.—Incandescent lamps, fittings, &c.

Dover.—T.C. McIntosh Cable Co., cable, £3,395, for extensions.

Glasgow.—The Clyde Navigation Trustees have accepted the offer by Messrs. Crompton & Co., Ltd., for electrical spares for 32-ton cranes at Queen's Dock and Rothesay Dock.

London.—Hackney.—The Electricity Committee recommends that, owing to the increase in the price of materials, the contract with the B.I. & Helsby Cables, Ltd., for armoured cables, be varied according to a submitted schedule.

Battersea.—The Electricity Committee recommends that the contract with Callender's Cable Co., for cables, be renewed for one year from April 1st next, on specified terms and conditions.

L.C.C.—The Highways Committee has accepted the tenders of the Morgan Crucible Co. for carbon brushes, at £14 10s. per 1,000, items 1 and 2, Class T (tramway equipment, &c., 1915-16), and Le Carbone, for carbon brushes, item 3, at £13 10s. per 1,000.

The contract with Hadfields, Ltd., for special trackwork in connection with the tramways, is to be extended for one year from July, 1916, and thereafter until determined, by 12 months' notice, the prices to be revised every three months.

The Committee purchased 28,241 tons of coals for Greenwich generating station, for £36,755, during the last quarter of 1915.

Manchester.—Electricity Committee.

Bertram Thomas.—One low-tension switchboard.
Johnson & Phillips, Ltd.—Low-tension cable.
British Westinghouse Co.—Four 1,050/1,320 kw. rotary converters for sub-stations.
Bruce Peebles.—Two 1,050-kw. motor converters and two 200-kw. positive traction boosters for sub-stations.
Mirrlees Watson Co., Ltd.—Alterations, &c., to condensing plants.
Aiton & Co.—Pipework.
J. Hopkinson & Co., Ltd.—Valves.
B.I. & Helsby Cables, Ltd.—Cable.

Preston.—The Corporation has placed a contract for meters for the year with Messrs. Chamberlain & Hookham, Ltd.

Shanghai.—The General Electric Co. of China, Ltd., Shanghai, have for the sixth time secured the yearly contract for the supply of Osram traction type lamps to the Shanghai tramways.

Sheffield.—Tenders accepted by the Electric Supply Committee:—

C. A. Parsons & Co.—Turbo-alternator (duplicate of the one now on order), £37,625.
Stirling Boiler Co.—Three boilers and accessories, £34,400.
E. Taylor, Ltd.—Extending condensing water service, &c., at Neepsend, £3,560.
A. Reyrolle & Co.—Six-panel ironclad H.T. two-phase switchboard, £646.
J. E. Nadin.—Levelling coal storage site and laying steam crane track, £3,802.

NOTICE TO OUR READERS.

The Government has intimated its intention to reduce the supply of paper available for newspaper and other publications. The reduction will be such as to render economy in consumption imperatively necessary. The situation will have to be met in various ways, and in order to assist us in complying with the demands of the Government and to prevent disappointment due to inability to obtain copies, we shall be glad if readers of the Electrical Review will give a definite standing order to their usual newsagent or bookstall. This applies to all readers who do not receive their Review direct from these offices.

FORTHCOMING EVENTS.

Physical Society of London.—Friday, February 11th. At 5 p.m. At the Imperial College of Science, South Kensington, S.W. Papers "On a General Method for Comparing the Mutual Inductances between Two Coils with the Self-inductance of One of Them," by Prof. C. H. Lees, F.R.S., and "An Enclosed Cadmium-Vapour Arc Lamp," by Mr. H. J. S. Sand.

Manchester Association of Engineers.—Saturday, February 12th. At the Grand Hotel, Aytoun Street. Paper on "Oil Engines," by Mr. G. E. Windeler.

North of England Institute of Mining and Mechanical Engineers.—Saturday, February 12th. At 2 p.m. At Neville Hall, Newcastle-on-Tyne. General meeting.

Electro-Harmonic.—Monday, February 14th. At 6.15 p.m. At Holborn Restaurant. Ladies' Night. See our "Notes" to-day.

Society of Chemical Industry (Newcastle Section).—Wednesday, February 16th. At the Wood Memorial Hall, Newcastle-on-Tyne. At 8 p.m. Lecture on "The Problems of Coal with reference to the Complete and Proper Utilisation of Our Fuel Supplies," by Prof. H. E. Armstrong, F.R.S.

Chemical Society.—Thursday, February 17th. At 8.30 p.m. At Burlington House, Piccadilly. Ordinary Scientific Meeting.

Belfast Association of Engineers.—Thursday, February 17th. Paper on "Turbine Plant," by Mr. P. J. Plevin.

Institution of Electrical Engineers.—Thursday, February 17th. At 8 p.m. At Victoria Embankment. Seventh Kelvin Lecture, on "Terrestrial Magnetism," by Dr. C. Chree, F.R.S.

(Students' Section).—Wednesday, February 16th. At 7.45 p.m. At Victoria Embankment. Paper on "The X-Ray Tube and Modern Practice," by Mr. W. J. Jones.

Institution of Mechanical Engineers.—Friday, February 18th. At 6 p.m. At Gt. George Street, Westminster, S.W. Annual General Meeting.

Greenock Electrical Society.—Friday, February 18th. At 7.45 p.m. At the Temperance Institute, 19, West Stewart Street. Paper on "Electro-Plating," by Mr. S. V. Thorp.

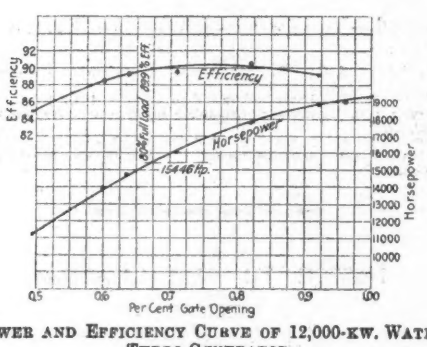
Royal Institution of Great Britain.—Friday, February 18th. At 5.30 p.m. At Albemarle Street, Piccadilly, W. Lecture on "Polarised Light and its Applications to Engineering," by Prof. E. G. Coker.

NOTES.

Foreign Trade.—The January Figures.—The following are the electrical and machinery figures given in the official returns for January:—

	Month of January.	*Inc. or dec.*
Imports.		
Electrical goods and apparatus, excluding machinery and uninsulated wire	£118,902	+ £62,037
Machinery	700,718	+ 82,314
Exports.		
Electrical goods and apparatus, excluding machinery and uninsulated wire	279,933	+ 10,040
Machinery	1,480,131	− 183,351

Tests on High-head Water-Wheels.—In the *Electrical World* of January 8th were given the results of tests on water turbines installed in the Tallulah Falls Station of the Georgia Railway and Power Co., in 1913. These sets were intended for a normal rating of 16 000 H.P. at 580 ft. effective head, when driving 10,000-KW. generators at 514 R P M, but as it was found that the generators could carry 12,000 KW. continuously at 80 per cent. power factor, the output of the turbines was raised to 18,000 H.P. Five sets are in place, with room for a sixth; they



Power and Efficiency Curve of 12,000-KW. Water Turbo-Generator.

are of the vertical-shaft Francis type, with bronze runners and forged steel gates, and weigh 300,000 lb. each. The working head is 606 ft., the highest head at which turbines are working in the United States. Three sets were tested individually, at 80 per cent. of their maximum output, the efficiencies recorded being 88·3, 89·9 and 88·7 per cent. The highest efficiencies were respectively 89·3, 90·4 and 89·5 per cent., at three-quarter gate opening and about 16,900 H P. The electrical output was absorbed by water rheostats at 63,500 volts. The accompanying curve shows the output and efficiency of No. 3 set, which gave the best results.

Proposed Standard Numerals.—In the *Journal* of the Institution of Electrical Engineers for February 1st a note by Mr. A. P. Trotter describing a set of proposed standard numerals for the scales of measuring instruments was published. After examining the numerals used on a large number of measuring instruments, including electricity meters, surveyors' staffs, and the Admiralty standard scales, the author designed the set in 1908 with the sole view of legibility (fig. 1); elegance of shape was not disregarded altogether, but wherever necessary it was sacrificed to legibility. Except, perhaps, in the case of the 1, there should be no serifs, and the figures should be of the block character—that is to say, there should be no marked difference in the thickness of

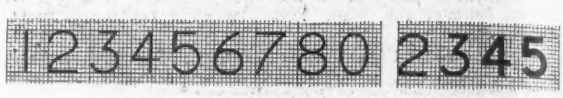


Fig. 1.—Numerals Designed by A. P. Trotter, Minimum Thickness.

Fig. 2.—Trotter Numerals, Various Thicknesses.

the line in any part of the figure. The relations between the 3, the 5, and the 8, and between the 6, or the 9, and 0 were considered with the object of preventing confusion. A height of 10 units and a width of 7 is recommended. The thickness of the line should not be less than one-twentieth of the height of the figure—that is, half a unit—nor thicker than 1½ units. In fig. 1 the minimum width of half a unit has been adopted; fig. 2 shows thicknesses of ¾, 1, 1¼, and 1½ units. To avoid confusion with 5, as well as with 8, Mr. Trotter strongly recommends the flat-topped 3. According to the usual practice, the 9 is simply the 6 reversed.

Industrial Banks.—Speaking at the annual meeting of Lloyds Bank, Mr. J. W. Beaumont Pease, deputy chairman, according to the *Times*, dealt with the criticism recently directed against English banking practice as compared with German. He laid down the proposition that, unless the interests of a bank were subordinated to the interests of the depositors, it was being run on unsound lines. Strictly no portion of a banker's deposits should be locked up in securities not easily realisable. In practice the exigencies of business involved a certain amount being so invested, but the aim of the banks was always to be prepared for the demands that their depositors might make upon them. It was not quite the same thing as regarded share capital, for that was an investment of a shareholder who had no right to demand his money back. A banker could not be blamed if he dealt with the capital in a more permanent form. German banks had comparatively a much greater proportion of capital than English banks, and they were, therefore, enabled to make much longer loans and less liquid investments. If that were an advantage to trade it might be worth while to consider what could be done by English finance in this direction, not through a bank dealing with depositors' money, but through a financial institution with a large capital which could undertake investments of the kind. He, however, could not help thinking that danger and harm rather than good might accrue to the trade of the country as a whole if banks became identified with particular companies or enterprises. It would tend in the direction of big trusts and monopolies. Time would shortly show whether the German banks had been secured on such sound foundations as our own.

Fatality.—Newcastle-on-Tyne.—An inquiry was held on the 3rd inst. into the death of S. J. Thomas, an electrician, which occurred at the Elswick works of Armstrong, Whitworth & Co. Deceased's brother, a foreman electric tester, stated that on 1st inst. he and his brother went into the casting department to test a fan motor. Close to the switch was a way by which coke was conveyed to the furnaces, and when the vehicles containing the coke were passing, the clearance was less than two feet. Deceased went straight to the switchboard, and witness heard a shout, and saw his brother leaning face forward against the switch. Artificial respiration was tried unavailingly. On examining the switchboard witness found that a joint in the wire leading to the meter had been bared. Deceased was an experienced man, and it was most unlikely that he would start to bare the joint while it was alive. He thought his brother would have opened the switch before touching the wire, and then taken the tape off the joint, but that in avoiding the coke conveyor he had accidentally pushed the switch in, while he still had hold of the wire, and thus had received the fatal shock. A verdict of "Accidental death" was returned.

Federation of Engineering Labour.—A scheme for closer unity among the organisations forming the Engineering and Shipbuilding Trades Federation has now been approved by the majority of these societies. The scheme does not include amalgamation, but its object is to federate the unions so closely that they will act as one body in all matters of wages and conditions. Amongst the societies whose members have already accepted the scheme by an overwhelming majority are the Amalgamated Society of Engineers, the United Patternmakers' Society, the Electrical Trades Union, and the Gasworkers and General Labourers' Society.—*Standard.*

Radiograph Ambulance Cars.—At a recent meeting in aid of the Radiograph Ambulance Cars Fund, Sir James Mackenzie Davidson said the value of X-ray motor ambulances at the fighting fronts was beyond all question, and the promoters of this fund were conferring a great practical benefit upon the wounded in the war.

Italian Hydro-Electric Works.—A decided awakening has been brought about in Italy directly and indirectly through the war, both privately and in Government circles. The campaign instituted by Signor Conti in favour of the development of the hydro-electric works has now been followed by the inauguration of propaganda by the Italian Electro-technical Association, with a view to the advancement of the production of native machinery and apparatus, and by the issue of two Government decrees which were published, and came into operation on January 18th. Both decrees aim at the securing of some relief from the extremely unfortunate coal crisis which prevails in the country owing to the comparative scarcity of the tonnage arriving from abroad, and the very high prices to which steam coal and house coal have risen when actually delivered in the country, in consequence of the enormous advance in the rates of freight. In the first decree, it is ordained from the present until further notice that the public lighting must be reduced by one-half in all towns where the supply is effected either with gas (exclusive of acetylene) or with oil or with electrical energy produced by the use of steam or gas or oil engines, or where these systems are used in combination. When the public lighting is carried out partly as mentioned, and partly by means of energy furnished by hydro-electric works, the reduction must be effected by decreasing or by entirely suppressing the service afforded by the former systems. In the case of public lighting, which is wholly supplied from hydro-electric works, the prefect of the province can enforce a reduction to one-half in order that the energy thereby rendered available may be utilised also beyond the towns or province, so as to decrease or suppress the employment of the before-mentioned systems or be utilised for heating, motive power or other industrial purposes beyond the towns or the province. The decree also empowers the town councils to curtail the number of public electric lamps and hours of lighting per day, and during the hours when the public lighting is completely suspended, it will be possible for the councils in agreement with the prefect also to stop electric lighting by private consumers.

The second decree seeks to obtain a more rapid increase in the production of electrical energy by the existing hydro-electric works. It is considered to be urgent to promote the national economy in this direction, which is seriously threatened by the augmentation in the prices of coal. As a consequence, and on the proposal of the Ministry of Finance, and in agreement with the Minister of Public Works and Agriculture and Industry, it has been arranged that concessions can be granted by the Ministry of Finance, without the formality of inquiry, for securing an increase in the water taken from the public watercourses by means of modifications in the present methods of taking off the supplies, excepting when the rights of third parties are concerned. Naturally the decree is merely a temporary expedient, but further developments appear to be in early prospect, with the object of securing substitutes for coal, as has been suggested to the Government. One of these which is now engaging the attention of the Government relates to the introduction of a measure which would be less complicated in the formalities to be complied with by those seeking the grant of concessions for the utilisation of water powers for the production of electrical energy, and there is little doubt that the industrial awakening now in progress will lead to an improvement in this respect and strengthen the hands of those members of Parliament who have been enlightened on the matter by the programme initiated by Signor Conti a few weeks ago.

National Illumination Committee of Great Britain.—The report of the chairman (Mr. W. Duddell), presented at the special annual meeting of the Committee, on January 27th, states that during the year 1915 a great part of the international work which was contemplated has been wholly suspended. Mr. Trotter's proposal that the height of the amyl-acetate flame which afforded the light of one standard candle should be determined, was adopted, and reports were received from Dr. Houstoun and Profs. Mather, Marchant and Morris. A paper by Dr. Ott, of Zurich, on the "Effect of Variations in Atmospheric Conditions on the Light of the Hefner Lamp," was received, and was published in the technical Press.

Institution and Lecture Notes.—Institution of Electrical Engineers.—As soon as the approval of the Board of Trade is obtained, the Council proposes to call a special general meeting of the corporate members to consider and, if approved, to adopt the following addition to the articles of association:—

Addition to Article 41.—"(*a*) In the event of a state of war arising between Great Britain and any other country or State, any member of any class who at any time during such war shall be a subject of such enemy country or State shall forthwith cease to be a member of the Institution, and in the case of the European War of 1914 all such members shall cease to be members of the Institution on and after . . . ." (The date to be inserted will depend on the date of confirming the resolution.)

The Council has also received a petition signed by 17 corporate members with regard to the expulsion of enemy aliens, asking that in accordance with Article 80, the Council shall call a special general meeting for the purpose of dealing with the matter. It is understood that the signatories are of opinion that the alteration proposed by the Council will effect the object of the petition.

At a meeting of the WESTERN LOCAL SECTION on Monday, at the South Wales Institute, Cardiff, a paper was read by Mr. O. L. Record on "The Testing of Underground Cables with Continuous Currents." The essence of the paper was the description of the Delon Special Testing Apparatus for testing with direct current, the principal advantages of which are that high pressure tests can be carried out without damage to the cable, and that the necessity for transporting cumbersome apparatus in case of alternating current is obviated, the Delon D.C. apparatus being capable of transportation in a suitable handcart. Mr. W. A Chamen, Mr. Tremain, Mr. C F. Proctor, and Mr. C. T. Allan asked questions on various points of detail, and expressed high appreciation of the paper. Subsequently the members sat down to an informal dinner at the Park Hotel.

At a meeting of the SCOTTISH LOCAL SECTION in Edinburgh, on Tuesday evening, Mr. H. H. Harrison's paper on "The Principles of Modern Printing Telegraphy" was read and discussed.

At the meeting of the YORKSHIRE LOCAL SECTION on Wednesday last, the paper was read by Mr. O. L. Record, on "The Testing of Underground Cables with Continuous Current," and a discussion followed.

Society of Engineers (Inc.).—At the meeting of the Society on February 7th, the President's Gold Medal was presented to Mr. Arthur H. Barker, B.A., B.Sc., for his paper on "Future Developments in Heating and Ventilation," and the Bessemer Premium, value £5 5s., to Alphonse Steiger, for his paper on "The Modern Development of Water Power." Mr. Percy Griffith, M.Inst.C.E., President for the year 1916, then delivered his Presidential address in which, after some preliminary remarks, he discussed the status of the engineering profession. He considered that it was necessary to educate the public as to the functions, qualifications, rules of conduct and basis for remuneration of the various classes of engineers, and advocated the establishment of a new organisation, having as its main objective the consideration and settlement of problems common to the whole profession.

Junior Institution of Engineers.—In the immediate future the Society's programme includes lectures on "Chemistry and Engineering," by Prof. H. E. Armstrong; "The Use of Alternating Currents in Factories," by Mr. G. H. Ayres; and on "Electricity in Factories," by Mr. R. Rankin. On February 26th, at the King's Hall, Holborn Restaurant, the Institution has arranged to hold a Bohemian Concert in aid of the British Red Cross Society in general, and the City of London Red Cross Hospital in particular. Sir Boverton Redwood, Past-President, will preside, and will be supported by the Right Hon. the Lord Mayor of London.

Royal Society of Arts.—On Wednesday, Prof. J. A. Fleming read a paper on "The Organisation of Scientific Research in this Country," dealing with the subject under the heads of "Methods, Means, and Men."

Royal Institution.—In the course of his lecture last week on the industrial application of gaseous fuels derived from coal, Prof. W. A. Bone urged that in order to achieve the economies in respect of power production which were possible, existing inefficient plant must be scrapped and the distribution of electrical energy reorganised on the large scale as it had been on Tyneside.

Croydon Wireless Society.—On Saturday last Dr. Annesley Eccles gave a lecture on the detection and localisation of foreign bodies by means of X-rays.

Two Interesting Problems.—We have received solutions of the metal-sided cube problem from Messrs. E. Redman and H. W. Underhill, the former making the diagonal resistance ⅓ ohm and the latter 0·68 ohm. We are not satisfied, however, that either is correct, owing to the ambiguity of the question, which does not state clearly between what limits the side of the cube has a resistance of 1 ohm. The only rational way in which to deal with it, in our opinion, is to regard the side as having 1 ohm resistance between opposite *edges* when the current is led in and out uniformly along the whole width of the plate. If the current enters at a point the question of its distribution immediately arises; the resistance of the plate will then depend upon the position of each point. So long as the stream lines are straight and parallel, the resistance of a sheet of metal is a definite quantity, but when the stream lines are curved the problem becomes difficult. The *Wireless World*, in giving the solution to the magnet problem, adds a note: "Next month Dr. Fleming on the cube resistance problem," which points to the same conclusion; we shall await Dr. Fleming's views with interest.

Electro-Harmonic Society.—The next Concert (Ladies' Night) will be held at the Holborn Restaurant (King's Hall) on Monday evening, February 14th, commencing at 6.15 p.m. Morning dress. Sir William Slingo will preside. The artistes will be as follows:—Miss Olive Sturgess, soprano; Miss Norah Blaney, songs at the piano; Mr. Tom Kinniburgh, baritone; Miss Ivy Angove, violin; Mr. W. V. Robinson, Canadian entertainer; Mr. Nelson Jackson, selections from his repertoire. Mr. Bernard Flanders, A.R.A.M., solo pianoforte and accompanist.

Electricity Supply Engineers and an Enemy Black List.—It is stated that the Association of Municipal Electrical Engineers is asking the Government to instruct the Board of Trade to issue an authoritative list of alien enemy manufacturing firms now operating in Great Britain, in order that the members may, as far as possible, avoid the purchase of enemy manufactures.

The Australian Trade Commissioner.—Mr. G. T. Milne, H.M. Trade Commissioner for Australia, will arrive in this country on an official visit about the middle of March. Those desirous of interviewing him should apply early to the Director, Commercial Intelligence Branch, Board of Trade, London, E.C.

Speed and Mileage Ratings of Electrical Vehicles.—At a meeting of the American Society of Automobile Engineers recently held in New York, the following recommendations of the Electric Vehicle Division with regard to standard ratings in connection with the mileage and speed of electrical motor vehicles were adopted:—"Electric vehicle speed ratings shall be based on continuous operation with one-half load over hard, smooth and level roads or pavements at the actual average battery charge." "Electric vehicle mileage ratings shall be based on a continuous run at the S.A.E. rated speed with one-half load over hard, smooth and level roads or pavements."

Volunteer Notes.—Engineering Institutions' Volunteer Engineer Corps.—Orders for week commencing February 14th, 1916.—By Lieut.-Col. C. B. Clay, V.D., Commandant.

Drills, 6.25 to 7.25; 7.25 to 8.25 p.m.

Monday, February 14th.—Sections 1 and 2, Technical; Sections 3 and 4, Lashings and Trestle Bridging, Signalling Class and Recruits.

Tuesday, February 15th.—School of Arms, 6 to 7 p.m.

Thursday, February 17th.—Shooting for Sections 3 and 4.

Friday, February 18th.—Sections 3 and 4, Technical; Sections 1 and 2, Lashings and Trestle Bridging; Signalling Class and Recruits.

Saturday, February 19th.—Adjutant's Instruction Class at 2.30 p.m.

E. G. Fleming,
Company Commander and Acting Adjutant.

3rd Batt. (Old Boys) Central London Regiment (Volunteers).—Battalion Orders by Colonel S. G. Grant (Officer Commanding), Thursday, February 10th, 1916:—

Week-end Parades.—Saturday.—The Battalion, less Platoons Nos. 10, 15 North London and 11, will parade at Wembley Park at 3.15 p.m. for drill under Company Officers. "Derby" recruits are invited to attend.

Sunday.—The Battalion will parade, as strong as possible, at 9.40 a.m., outside the entrance to Euston Station (L. & N.W.R.), Euston Road, for Divine Service. Dress—Uniform, with side-arms only. Overcoats will not be carried.

After the Church Service the Parade will be inspected by the Lord Mayor.

Musketry.—The Inter-Platoon Competition will be continued on Saturday, the 12th inst. when the semi-final round will be completed. The competing platoons Nos. 10 and 15, North London and 11, to attend at the Acton Range at 1.30 p.m.

A. G. Joiner, *Major and Adjutant*, O.B.C.

Artists' Rifles, O.T.C.—One remarkable effect of the Earl of Derby's Recruiting Scheme has been that a large number of professional men from the technical trades, including architects, engineers and surveyors, having realised that they must no longer delay offering their services to the country, have applied to the Artists' Rifles, O.T.C., for direct enlistment. Moreover, of those who have attested under the scheme, many have felt impatience for their Groups to be called up, and, solving the problem for themselves, have applied for, and obtained, transfer from Army Reserve B, in which Derby recruits are placed, to some Regular or Territorial unit. This course is particularly favoured by men whose education and social position render them eligible for commissions. The transfer of men who have been placed in Army Reserve B may be effected as soon as possible after they have been approved and found medically fit, or postponed until a later date, provided that at such later date the requirements of the Service require the transfer. The Corps has a special class for training members who desire to obtain commissions in the Royal Engineers and Pioneer Battalions, and for testing candidates for such commissions.

Appointments Vacant.—Power house staff for the Southern Command, Salisbury; shift engineer for Reigate. See our advertisement pages to-day.

Submarine Power Cables.—Two 11,000-volt submarine power cables have recently been laid across the Golden Gate at San Francisco, for the extension in that city of the Pacific Gas and Electric Co.'s distributing system. The cables, which are about 13,000 ft. long, were laid under unusual difficulties, incident to swift current and deep water, as well as to dangers in the heavy fogs, from the shipping that plies in and out continuously through the entrance to the harbour. However, the work was completed on schedule time, and the cables successfully passed the 22,000-volt test to which they were subjected immediately after the work was done.—*Electrical World.*

Inquiries.—A correspondent who is erecting an overhead traveller on cast-iron columns 11 ft. high × 5 in. diameter, ⅜ in. thick, proposes to fill the columns with fine concrete, and inquires whether it would be advisable to reinforce the concrete inside with ½ in. iron rods; also, whether there would be any trouble through expansion of the concrete.

A correspondent asks for the address of the maker of "Castle No. 5" accumulators.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station Officials.—The Skelton and Brotton U.C. has appointed Mr. G. Dixon engineer of the Council's electricity supply undertaking at a salary of £177 per annum, Mr. Dixon to be allowed to continue his appointment as engineer for the Cleveland and Durham Electric Power Co. in East Cleveland.

The Melbourne City Council has increased the salary of Mr. H. R. Harper, city electrical engineer, from £1,000 to £1,250 per annum.

General.—Mr. W. Eckford, electrical engineer for the Wingate, Wheatley Hill, and Thornley Collieries Co., Durham, has been presented by the officials with a marble timepiece, on the occasion of his leaving to take up similar duties under the South Moor Coal Co.

Councillor J. J. O'Neill has been re-elected chairman of the Dublin Electricity Committee, and Councillor C. McGuinness has been elected vice-chairman.

The marriage of Mr. H. F. Parshall to Miss Ellen Dunlop Payne, of Boston, U.S.A., was solemnized at Penn, Bucks, on January 31st.

The *London Gazette* announces that Mr. J. S. Pringle has been appointed an electrical engineer in H.M. Naval Establishment.

Mr. S. A. Jeavons, chief clerk at the Stockton-on-Tees Corporation electricity works, has passed the Intermediate Examination of the Chartered Institute of Secretaries at Manchester University.

Roll of Honour.—Captain (temporary Major) A. E. E. Fawcus, of the 7th Battalion Manchester Regiment, who has won the Military Cross, was an electrical engineer, and, with his father, was interested in estate development in East Africa.

Private Harry Haughton, of the 9th Battalion King's Own Royal Lancasters, formerly in the employ of Messrs. Mather and Platt, is reported a prisoner of war in Bulgaria.

Sapper Walter Fox, of the Royal Engineers, who has just been gazetted a Second-Lieutenant, was, up to two years ago, employed at the Stalybridge Joint Board's generating station, and subsequently went to an appointment at Singapore.

Private J. McCabe, of the King's Own Scottish Borderers, prior to the war employed at the British Westinghouse Works, Trafford Park, has been killed in action.

Private W. Hope, of the 20th Hussars, reported wounded, was, prior to the war, on the electrical staff at the collieries of Messrs. Fletcher, Burrows & Co., Atherton.

Colonel Brighten, chairman of the Jackson Electric Stove Co., Ltd., was mentioned in dispatches with reference to fighting in the Gallipoli Peninsula. He has since received the Most Distinguished Order of St. Michael and St. George.

Private O. N. Soper, of the 5th Buffs (East Kent Regiment), who has been wounded in action in Mesopotamia, was on the electricity staff at the S.E. Railway works at Ashford (Kent) before the war. Private A. L. Baker, of the 5th Buffs (East Kent Regiment), killed in action in Mesopotamia, was engaged in the electricity department at the same works.

Private Wm. T. Playford, of the 8th Buffs (East Kent Regiment), who was, until the war, on the staff of the Isle of Thanet Electric Tramways Co., has been wounded in action in France.

Sergeant Herbert Neale, of the 7th Norfolk Regiment, late of the staff of the Bradford City tramways department, has been killed in action in France.

Lance-Sergeant J. F. Gell, of the 3rd Company, 18th Battalion King's Liverpool Regiment, who has been killed by shell fire in France, was, before the war, on the staff of the electricity department of Wallasey Corporation.

The D.C.M. has been awarded to Regimental Sergeant-Major Ben Tripp, of the South Lancs. Regiment, who was, prior to the war, engaged at Manchester with the British Westinghouse Electric & Manufacturing Co., Ltd.

Corporal T. Fearing, of the 3rd East Lancs. Field Ambulance, Royal Army Medical Corps, who was engaged at the Bury (Lancs.) Corporation electricity works, has been awarded the D.C.M. for gallantry at the Front.

Obituary.—Mr. Herbert Kingsford.—The death occurred on February 5th, in his 59th year, of Mr. Herbert Kingsford, of Lima, Peru, engineer to the Central and South American Telegraph Co.

Will.—The late Mr. H. A. Taylor (Clarke, Forde & Taylor) left £42,529.

REVIEWS.

Specification and Design of Dynamo-Electric Machinery. By M. Walker. London: Longmans, Green & Co. Price 32s. net.

The author of this book says that a serious apology is needed for adding another book on the design of dynamos to our already overcrowded shelves, but as there appeared to be no book of electrical precedents analogous to the famous "Conveyancing Precedents," compiled by Prideaux, it occurred to the author that such a book would be of some use to those engineers who from time to time have to draw up specifications for the purchase of electrical machinery. We are glad that such an idea did so occur to him. The book not only deals with specifications for electrical machinery, but also outlines a method by which the specifications may be complied with by manufacturers.

The book is divided into two parts. In Part I rules for use in the design of dynamo-electric machinery are discussed, while in Part II the specification and the design to meet the specification are treated of.

Chapter 1 is introductory, and points out certain well-known facts in a refreshing manner.

The magnetic circuit is dealt with in Chapter 2. The effect of the number of poles on the general design is well discussed, and we are glad to see that attention is drawn to the fact that revolutions per minute have a superior limit as far as reducing material goes. For example, the material for a 4-pole 25-cycle machine running at 750 revolutions per minute is rather less than for a 2-pole machine running at twice the speed. Of course, special reasons may demand the higher speed in spite of this fact. Certain neat methods for determining field forms for salient and distributed windings are given.

In Chapter 3 the electromotive force coefficient is considered in detail, and a short précis of important papers is given.

The vital subject of materials of the magnetic circuit is then discussed. The author very rightly employs throughout the book, in the main, the metric system of units. As he says, this will be the system which will probably be most generally employed in the future. The reviewer and, in fact, all the practical designers he is acquainted with, use this system, and then, where necessary, convert their millimetres into inches for the benefit of the British workman. Most designers at some time or other have known two continuous-current motors, that have been wound to the same specification, to run on test at appreciably different speeds. This kind of thing is well accounted for on page 37, where the reasons for considerably different magnetic properties of cast iron from two different pourings from the same ladle are dealt with. A number of prices are given for different kinds of material. These are quite of the right order at normal times. Iron losses are also discussed in a clear and practical manner.

Chapter 5 deals with the different parts of the magnetic circuit, such as shapes of slots and teeth, flux distribution behind teeth, and so on.

The electric circuit is next considered. A very large number of winding diagrams are given, all being for alternating-current generators and motors. The windings are all printed in one colour, the different phases being indicated by full and dotted lines. A considerable number of useful tables, not before easily accessible, are also given. The forces on armature conductors, due to short circuits, etc., are briefly considered, the reader being referred for full details to the author's classic paper on the subject, read before the I.E.E. several years ago. A useful abstract of Field's paper on eddy currents in armature conductors is also given in this chapter. A misprint occurs on page 143, in which the diameter of a No. 13 S.W.G. wire is given as .92 in.

The actual design of armature coils and the formers required for their manufacture is then dealt with in Chapter 7. A large number of photographic reproductions and line diagrams are given, together with specimen specification forms for different types of mouldings, etc. Altogether this is a valuable feature, much information not easily obtainable elsewhere being presented in a convenient form.

Insulation—in one sense the most important part of a dynamo-electric machine—is then discussed. The author has given liberally of his extensive investigations in the subject as well as of those of others. The mechanical properties and strength of many types of insulation are given, and also sound advice regarding pressure tests, insulation resistance, and so forth.

Chapter 9 treats of the difficult subject of ventilation. Turbine-driven machinery, as is natural, is discussed more fully than other types by means of diagrams giving outlines of the schemes adopted by various makers.

Chapter 10 is devoted to the predetermination of temperature rise. Much of the information published in the author's paper, "Heat Paths in Electrical Machinery," before the I.E.E., is reproduced, together with additional matter. The determination of this temperature rise will always be the most difficult part of electrical machine design, but the author deals with the matter in a searching and scientific manner. At the same time, the reviewer knows from personal experience that some of the rules given here do not fit all machines by any means, the rules, however, always giving results well on the safe side.

Part II of the volume commences in Chapter 11. The specification and design of alternating-current generators is first taken. It may be safely said that practically the whole of the theory of alternating currents that is useful in actual design is given, and also a fairly complete list of references on the subject. We are glad to see that it is pointed out that the ordinary d^2l formula for commencing the design of a new A.C. generator cannot be intelligently used unless account be taken of not only the regulating properties of the generator, but also the effect which the frequency and speed have upon the number of poles and the cooling conditions of the field coils. Though the book is certainly not of an elementary character, we think a list of $d\ l$ values might have been included as a preliminary guide. Engine, water wheel, and turbine-driven alternators are all considered in turn, the treatment on the whole being quite satisfactory.

Induction motors are next dealt with in a similar fashion. This time the circle diagram is well to the fore, and also a table of output coefficients is given.

Chapter 18 deals with continuous-current generators. The various types of continuous-current windings are not described since, as the author says, they are fully dealt with in many text books, but the principles governing good commutation receive special attention. No d^2l table is given, but several different sizes of machines are worked through.

One of the author's specialities is next considered, *i.e.*, rotary converters. Probably Prof. Miles Walker has done more towards developing this type of electrical apparatus than anyone else in the country. Much of the ordinary theory of heating of armature conductors, etc., is not given, quite rightly in a book of this kind, but a considerable quantity of useful information is put forth in an illuminating manner. The application of the various rules is exemplified by outlines of the design of two rotaries. This is a most readable chapter.

The concluding chapter gives a short account of the specification and design of phase advancers. The different types of windings, etc., peculiar to this type of apparatus, are well described.

Taken on the whole, the book is a mine of wealth for the experienced designer. Beginners will not progress very far if they commence with this book—in fact, the author assumes "that the reader is familiar with the laws of electricity and magnetism as applied to the design of dynamo-electric machines, and that he is conversant with the theory and operation of these machines as given in the many excellent text books on these subjects."

The general method of design is that developed by Mr. B. G. Lamme, of the American Westinghouse Co.

In the specification part of the volume the author—very rightly in the reviewer's opinion—takes the view that it is the function of the consulting engineer or buyer to state precisely what he wants to buy, and to leave to the manufacturer the methods of attaining the results called for.

The book is well printed, and will be for years a classic on the subject of which it treats.

Wireless Time Signals. London: E. & F. N. Spon, Ltd. Price 3s. 6d. net.

The official handbook "Réception des Signaux Radiotélégraphiques par la Tour Eiffel," issued by the Paris Bureau of Longitudes, is of such practical value to navigators, geodesians, explorers, and horologists as to justify completely the preparation of this authorised translation, to which the translators have added useful appendices, tables, and a short vocabulary, materially increasing the value of the book. To the expert this treatise will be found invaluable as a work of reference; to the amateur it provides a lucid exposition of the principles of wireless telegraphy, supplemented by practical notes on the construction of installations suitable for his use in receiving time and weather signals, etc. The arrangement and illustration of the book are admirable, and a very praiseworthy feature is that the book deals thoroughly with its subject matter, and does not wander outside the latter; this is by no means always the case in these days of ramified and detailed technology.

The instructions given for the erection and adjustment of receiving apparatus should enable anyone to get good results and to take an intelligent interest in the manipulation of his apparatus. The importance of the Eiffel Tower signals is discussed briefly in Chapter II, and the nature of the signals and the means by which they are produced is then described. The remainder of the chapter is devoted to explanation of methods by which the signals are utilised by the recipient and allowance made for various retardations, etc., to obtain a time reading accurate within 0.1 second or so—which is near enough for navigation, watchmakers', and most other practical requirements. For scientific purposes, and for the benefit of explorers and geodesians, it is desirable to make yet more accurate determinations of time, and the general means by which this is done are indicated in Chapter III. There is no purpose in seeking higher accuracy of comparison than 1/100 or 1/140 second, and this degree of accuracy is already attainable. The methods of making and calculating comparisons by aid of the scientific time signals are described very minutely, and by following the text carefully and referring to the folding plate and typical record sheets included, the reader should learn all that can be learnt from paper in this connection.

Appendix "A" enumerates the time signals and meteorological radio-telegrams transmitted daily from the Eiffel Tower

at the time this treatise was prepared. Appendix "B" deals with augmented weather reports subsequently arranged, and presents a miscellany of useful information, including a time-table, which shows that in almost every hour of the day and night there is (in normal times) some report or official signal of interest and value, which can be picked up even by the amateur. Tables of international time signals, call letters, code and vocabulary, a useful collection of meteorological tables, and a good index conclude a volume which is indeed "indispensable to the great and ever-widening circle of all those interested in wireless." It is, moreover, a work which can be studied profitably pending the time when we can make practical application of the information which it contains.

Experimental Physics. By H. A. Wilson, F.R.S. Cambridge University Press. Price 10s. net.

This is a text-book of mechanics, heat, sound, and light issued in the now famous "Cambridge Physical Series," and although it emanates from Texas, U.S.A., the name of H. A. Wilson, "formerly Fellow of Trinity College, Cambridge," guarantees its English wholesomeness.

The author admits that the writing of such a book, primarily intended for a first-year college course, offers little scope for originality. He appears, however, to have discovered considerable scope for originality in his decisions what to include and what to leave out, justifying his selections by remarking, "the kind of text-book which contains a little about everything does more harm than good."

Dr. Wilson has obviously aimed at excluding everything not of fundamental importance. In each chapter a subject is discussed theoretically and then a few experiments are described fully and the various applications mentioned. Such subjects as Gravitation, Expansion of Solids, Change of State, Convection and Conduction, Resonance and Photometry, appear to lend themselves admirably to the author's "irreducible minimum" method; for it is very true that if a student thoroughly grasps the principles of, say, Searle's Conductivity Experiment, there is no need to teach him any more; he is then in a position to add to his knowledge of Conduction of Heat by reading up details of other experiments for himself. But it seems to us that the method breaks down when it attempts to deal with such a subject as "Motion," including uniform, accelerated and simple harmonic motion, in eight pages. Mechanics, and especially the early portions of the science, cannot be adequately treated without frequent recourse to graphical and other examples, and a mere reading of the chapter in Dr. Wilson's book would not, we fear, put the ordinary first-year college student in a position to tackle problems in Kinematics. The treatment of Force and Motion, Work and Energy, and Mechanics of Rigid Bodies is fuller and, consequently, more satisfactory. The chapter on "Properties of Liquids" is the best in Part I (Mechanics), and suffers least from the author's pronounced tendency to evaporate his subjects nearly to dryness.

Part II (Heat) is thoroughly sound and satisfactory, the best chapters out of eleven excellent ones being those on the conversion of heat into work and the properties of gases.

The subject of Sound (Part III) naturally involves more mathematical treatment, but all the essential experiments are described. The author's capacity for getting to the point in a very few words is especially noticeable in the sections on Reflection, Refraction, Interference, and the Composition of Vibrations. The diagrams in this part of the book are also exceptionally good.

The last part of the book is devoted to the treatment of Light and Radiant Energy, and the author follows the usual methods of dealing with reflection and refraction at plane and spherical surfaces. Dispersion and Colour are given considerable attention, and there are also good chapters on Velocity of Light, Interference, Diffraction, and Polarisation.

On the whole, Dr. Wilson's book is one that can be recommended to first-year college men whose knowledge of physics is scanty; but the mere reading of it will avail but little without the working of numerous examples. Unfortunately, there are no exercises given in the book, but references are given to most of the standard works on the various subjects, so that a student who has access to a good reference library and is prepared to work some examples could not do better than adopt Dr. Wilson's book, remembering in doing so that, to adapt an old maxim, "Examples are better than precepts."
—P. H. S. K.

NEW COMPANIES REGISTERED.

Brown's Motor Accessories, Ltd. (142,891).—This company was registered on February 2nd, with a capital of £6,000 in £1 shares, to take over the business of motor accessory dealers and electrical engineers carried on by H. Lodge and H. Bebbington, at 56 and 58, Renshaw Street, Liverpool, as Brown & Co. The subscribers (with one share each) are: H. Lodge, 50, Falconer Street, Liverpool, electrical engineer; H. Bebington, 51, Bagot Street, Liverpool, electrical engineer. Private company. The number of directors is not to be less than two or more than five; the first are H. Lodge and H. Bebington. Solicitor: E. Lloyd, 31, North John Street, Liverpool. Secretary (*pro tem*): Mary C. Dodd. Registered office: 56 and 58, Renshaw Street, Liverpool.

Lidgett Engineering Co., Ltd. (142,921).—This company was registered on February 4th, with a capital of £5,000 in £1 shares (1,500 pref.), to take over the business of a mining, electrical and mechanical engineer carried on by G. F. Steavenson, as Steavenson & Co., at Lidgett Electrical Engineering Works, Hoyland Common, Barnsley. The subscribers (with one share each) are: G. S. Marple, Manor House, Oakdale Road, Nether Edge, Sheffield, iron and steel merchant; G. F. Steavenson, Lidgett House, Hoyland Common, engineer. Private company. The number of directors is not to be less than two or more than five; the first are G. S. Marple and G. F. Steavenson. Qualification, £100. Remuneration (except any managing director) as fixed by the company. Solicitor: C. Crowther, 23, Abingdon Street, S.W. Registered by Jordan & Sons, Ltd., 116-117, Chancery Lane, W.C.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Railless Electric Traction Co., Ltd. (9,872).—Capital, £5,000 in 4,750 ord. shares of £1 each and 5,000 def. shares of 1s. each. Return dated January 6th, 1916. 2,571 ord. and 5,000 def. shares taken up; £1 per share called up on 2,056 ord. shares; £1,916 paid, leaving £140 in arrears; £765 considered as paid on 515 ord. and 5,000 def. Mortgages and charges: Nil.

Cordoba Light, Power and Traction Co., Ltd. (99,640).—Capital, £1,000,000 in £1 shares (300,000 pref., 600,000 ord., and 100,000 pref. or ord.). Return dated December 30th, 1915. 300,000 pref. and 600,000 ord. shares taken up; £1 per share called up on 300,000 pref. and 170,100 ord.; £470,100 paid; £429,900 considered as paid on 429,900 ord. shares. Mortgages and charges: £482,700.

Power Gas Corporation, Ltd. (70,860).—Capital, £300,000 in 250,000 ord. shares of £1 each and 100,000 def. shares of 10s. each. Return dated December 30th, 1915. 249,620 ord. and 100,000 def. shares taken up (exclusive of 380 ord. forfeited); £1 per share called up on 183,158 ord. shares; £183,478 paid (including £320 paid on 380 ord. shares forfeited); £116,462 considered as paid on 66,462 ord. and 100,000 def. shares. Mortgages and charges: £75,000.

Electro Galvanizers, Ltd. (138,767).—Capital, £20,000 in £1 shares (12,000 first pref., 5,000 second pref., and 3,000 ord.). Return dated January 14th, 1916. 11,500 first pref., 4,600 second pref., and 3,000 ord. shares taken up; £19,100 considered as paid. Mortgages and charges: Nil.

Colston Electrical Works, Ltd.—Mortgage on moneys payable to the company by the Corporation of Bristol for installing electric lighting and electric bells at the Ham Green Sanatorium, Somerset, dated January 25th, 1916, to secure all moneys due or to become due from company to Capital & Counties Bank, Ltd., Clare Street, Bristol.

Masham and District Electric Supply Co., Ltd.—Particulars of £500 debentures, created January 19th, 1916, filed pursuant to Section 93 (3) of the Companies (Consolidation) Act, 1908, amount of the present issue being £440. Property charged: The company's undertaking and property, present and future, including uncalled capital (if any). No trustees.

Foote and Milne, Ltd.—Mortgage debenture, dated January 28th, 1916, to secure £6,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: London County & Westminster Bank, Ltd., 41, Lothbury, E.C.

Hindhead and District Electric Light Co., Ltd. (78,361).—Capital, £30,000 in £1 shares. Return dated May 17th, 1915. 24,142 shares taken up; £13,642 paid; £10,500 considered as paid. Mortgages and charges: £4,450. Returns of allotments made up to October 21st and December 18th, 1915, show a further 465 ord. and 42 ord. shares respectively allotted for cash.

Burmah Electric Tramways and Lighting Co., Ltd. (75,090).—Capital, £200,000 in £5 shares (20,000 pref.). Return dated January 7th, 1916. All shares taken up; £5 per share called up on the pref.; £100,000 paid; £100,000 considered as paid on the ord. Mortgages and charges: Nil.

CITY NOTES.

Yorkshire Electric Power Co.

The net profit for 1915 was £21,209 (1914, £20,535), plus £3,049 brought forward. Preference dividend (6 per cent.) has been paid, £7,500 put to general reserve, £1,908 written off the 1915 Bill, 1 per cent. is to be paid on the ordinary shares, and £2,478 is to be carried forward. Costs of all materials, especially coal, have been very heavy, but there has been a substantial growth of gross revenue. 27 per cent. of the staff enlisted, and men of military age have attested, and there has been difficulty in obtaining experienced labour and in maintaining the supply. The supply has been largely used by munitions factories, and the demands upon the company in connection with collieries and coke ovens with their associated chemical works for the extraction of valuable products from coal have grown considerably. £13,840 cum. pref. shares have been taken up during the year. Of the 5½ per cent. first mortgage debenture stock of the Yorkshire Waste Heat Co., Ltd., only £19,205 is left, and the directors commend this stock to the proprietors of the Power Co. Annual meeting: February 15th.

Lanarkshire Tramways Co.

During 1915 the revenue was £106,044, an increase of £6,866, and the expenses were £66,091, an increase of £1,896. £11,000 is to be transferred to depreciation reserve, and after providing for debenture and other interest and other items £20,971 is available. A dividend of 5¼ per cent. for the year is paid, and £958 is carried forward. £4,500 debentures have been purchased and redeemed during the year. Four more motor omnibuses will be put into service in March. The accounts will be issued yearly in future, instead of half-yearly. Passengers carried 20,526,000, as against 19,394,282; traffic receipts £104,990, as against £97,958; mileage, 2,264,922, as against 2,330,903.

St. James' and Pall Mall Electric Light Co., Ltd.

During 1915 the connections increased from 15,423 kw. to 16,305 kw., and 10,674,609 units were supplied; the Central Electric Supply Co. is paying no dividend for the year. War conditions have again reduced revenue. The net profit was £18,836, plus £2,417 brought forward, and £4,500 is transferred from the contingency fund. After paying 7 per cent. on the preference shares and 8 per cent. on the ordinary, £2,752 is to be carried forward. The units generated by steam plant were 970,514, and purchased 12,842,237 = 13,812,751. Private supply required the number stated above, works accounted for 242,343, batteries 267,103, transmission and transformation for 1,899,552, and distribution, &c., for 729,144. At the annual meeting on Tuesday next shareholders will be asked to increase the borrowing powers from one-half the nominal capital to £50,000 in excess of that amount.

Metropolitan Railway Co.

The directors' report for 1915 shows as follows:—Total net income £595,676, plus £11,458 brought forward. Deducting interest, renewals, and preference dividend, £77,093 is available for ordinary dividend, which is 1 per cent. for the year, leaving £13,041 to carry forward; £15,000 has been transferred to general renewals fund. The ordinary dividend for 1914 was £1 4s., and £11,458 was carried forward. The new viaduct at Kilburn had brought considerable additional traffic, owing to the improved train service that it had made possible. Under the arrangement with the Government, the company pays interest on the capital outlay on new lines and works, but receives no benefit from the improved earnings, and representations have been made to the Government on the point. Traffic on the G.N. and City section has largely increased. Notwithstanding the dislocation of business, the traffic of the entire railway was larger than in 1914 and 1913, and, while every possible economy had been introduced, they had not materially reduced the number of trains run. The annual meeting was held yesterday.

Llandudno and Colwyn Bay Electric Railway, Ltd.

Traffic receipts during 1915 increased by £1,811, largely due to the Old Colwyn extension, but increased cost of stores and frequent changes in staff caused less efficient and less economical working, so that the net profit is £5,414, only slightly larger than for 1914 (£5,144). Adding £562 brought forward and deducting sinking fund instalment, etc., £4,408 is available, and a dividend of 4 per cent. absorbs £3,976, leaving £432 to carry forward. The sinking fund instalment is considered sufficient to meet depreciation. The route length in operation is now 8¼ miles, and all the lines for which powers have been obtained have been constructed. Annual meeting: February 11th.

Paisley District Tramways Co.

For 1915 the revenue was £68,079 and the expenditure £45,737. After allowing for debenture and other interest and sinking fund charges, and including £3,200 brought forward, the balance is £19,488. £6,500 is put to reserve, 5 per cent. is paid on the preference shares, £2,000 is put to preference share sinking fund, and £3,478 is to be carried forward. Traffic receipts increased by £6,141, but expenses have largely increased. Work on the maintenance of track and rolling stock is deferred owing to scarcity of labour, and £2,000 more than usual has been carried to reserve for this purpose in future. The system is being carried on with difficulty, owing to abnormal circumstances, but so many munition workers use the system that the number of cars run cannot be reduced. Passengers carried 14,978,962, as against 13,755,904; care mileage 1,367,926, as against 1,378,120. Annual meeting: February 29th.

Chatham and District Light Railways Co.

During 1915 the revenue was £60,917, an increase of £9,865, and the expenses were £32,230, a heavy increase. £6,000 is to be transferred to depreciation reserve, and after providing for rent of Rochester Corporation lines £3,744, debenture and other interest, and other items, £15,733 is available. After paying 6 per cent. on the ordinary shares for the year, £3,150 is carried forward. Owing to shortage of labour and other causes, the track and rolling stock have not been maintained in their usual state of repair; £1,000 has been put to maintenance reserve to enable these repairs to be carried out when labour conditions are more favourable. A reduced service of cars has been run. £8,200 debentures have been repurchased and redeemed. Passengers carried 12,755,428, as against 10,662,928; traffic receipts, £60,357, as against £50,439; car mileage 1,029,535, as against 1,133,762.

Calcutta Electric Supply Corporation, Ltd.—The units sold during the five weeks ended December 31st, 1915, were 1,778,448, compared with 1,224,134 units in 1914.

Liverpool Overhead Railway Co.—A final dividend on the ordinary shares at the rate of 4 per cent. per annum brings up the total distribution to 3¼ per cent. for the year.

Cambridge Electric Supply Co., Ltd.—A final dividend of 3 per cent. on the ordinary shares brings the total distribution up to 5 per cent. for 1915.

Dublin United Tramways Co., Ltd.—Mr. W. M. Murphy, the chairman, told shareholders at the annual meeting that the gross receipts for 1915 were the largest in their history, being £333,589, against £321,896 in 1914, of which £11,677 was due to an increase in passenger traffic. The gross expenses exceeded those of 1914 by £18,143, the increase in expenses being greater than that in receipts by £6,140. Besides producing 803,389 more units of electric current, the average cost of about 24,000 tons of coal consumed was 3s. a ton higher than in 1914, being 18s. 5d. against 15s. 5d. The greatest increase in expenses was under the head of maintenance, amounting to £10,154, £2,700 of which represented new car motors and electrical car equipment.

Tyneside Tramways and Tramroads Co.—The directors recommend a dividend of 3 per cent., less income-tax, on the ordinary shares, £1,400 is placed to reserve for renewals, £500 to special reserve, £290 is applied to loss on conversion of Consols into War Loan, and £625 is to be carried forward.

Dr. J. T. Merz, at the meeting on Tuesday, said that the receipts had not been materially interfered with. There had been a marked increase in the ordinary traffic, but the holiday traffic had been less by some £1,400. They had run fewer cars, but had carried more passengers. The increase in expenditure was largely due to repairs and upkeep of the line.

Sunderland District Electric Tramways, Ltd.—After providing for interest on the prior lien bonds and the first mortgage debentures, and for sinking fund instalment, and making provision for depreciation on investments, there remains a net profit of £1,759. After paying interest at the rate of 2½ per cent. per annum (less income-tax) on the first income bonds, £651 is to be carried forward. The traffic receipts show a decrease of £522, but owing to economies in working expenses there is an increase in the profit of £580. The annual meeting was held in London on Tuesday.

Electrical and Industrial Investment Co., Ltd.—The net revenue for 1915 was £11,500, plus £10,377 brought forward. After paying 6 per cent. on the preference and 5 per cent. on the preferred ordinary shares, £10,878 is to be carried forward. The investments have been written down in accordance with the capital reduction scheme (£85,500). The balance at credit of reserve is £29,372. The company holds 225 investments standing at £545,681. Annual meeting: February 16th.

Central Electric Supply Co., Ltd.—During 1915 energy was supplied to the Westminster, St. James', and Chelsea Companies to the tune of 28,984,437 units. After allowing for sinking fund and depreciation, the net balance is £1 17s. 1d., plus £6 brought forward, and the amount is to be carried forward.

City of Buenos Aires Tramways Co. (1904), Ltd.—The annuity has been received from the Anglo-Argentine Tramways Co., and the net revenue for 1915 was £66,341. After paying 5 per cent. dividend for the year, £4,200 is transferred to the general amortisation fund, carrying forward £141.

National Electric Supply Co., Ltd.—A final dividend of 4s. 6d., making 7s. per share for the year, as compared with 8s. for 1914, is announced. £633 is carried forward, as compared with £1,310 brought in. £5,000 is put to depreciation.

National Gas Engine Co., Ltd.—The net profit for 1915 is £70,960. After paying 7½ per cent. on the ordinary, £30,520 is to be carried forward. Annual meeting: February 15th.

Smithfield Markets Electric Supply Co., Ltd.—Dividend 2 per cent. for year, carrying forward £1,300.

Parsons Marine Steam Turbine Co., Ltd.—Interim dividend 10 per cent., less tax.

Wadebridge and District Electric Supply Co., Ltd.—A dividend of 6 per cent. is announced.

STOCKS AND SHARES.

Tuesday Evening.

The electricity supply market was not affected by the dividend declarations which have been made up to the present. The West End companies, as it was generally supposed they would, have lowered their rates, but the South London provided a pleasant surprise by announcing the same dividend as that of a year ago—namely, 5 per cent.—on the strength of which the shares rose 7s. 6d. to 3¼. The St. James' & Pall Mall Co. has lowered its dividend to 8 per cent., being a reduction of 2 per cent. as compared with last year. Business for weeks past has been very quiet in the whole of this section, as we have noted from time to time; so it can scarcely be said that the Stock Exchange market has undergone any pronounced change. There is more doing in Latin-Canadian issues than in most of the home electrical securities; while the activity in rubber shares has been resumed to some extent.

The effect of the removal of minimum prices from Colonial Government stocks has been carried still further amongst the ranks of gilt-edged descriptions in the industrial departments. Where prices remain the same as they stood before the changes came about, the holder should hesitate to congratulate him-

self until he finds that the nominal quotation is an actual one from the point of view of the seller. It is, however, cheerful to observe how the Colonial stocks, which were exceedingly weak when the market in them was allowed to become a free one, have now mended considerably. Buyers have come forward to such an extent that the trouble is at present to find stock to satisfy them, instead of the other way round; and this, of course, exerts its sympathetic influence upon the debenture stocks, preference shares, and pre-ordinary issues of industrial and most other companies.

Business generally is quiet, and the declaration of a satisfactory batch of Home Railway dividends left the market cold. The railways are certainly doing better than might have been expected or supposed; and if they can make such good progress under the present difficult conditions, the outlook may be regarded with composure for the future.

Reference has already been made to the revival of orders in the Latin-Canadian list. It has been fairly well distributed over the principal companies concerned, and a good part of the buying is known to proceed from New York—this in spite of the fact that United States investors are obviously troubled as to the potentialities contained in the present diplomatic situation between their country and Germany.

Pennsylvania Water & Power shares have risen 3 points to 78¾, Shawinigan is 2½ up at 138, there are buyers about for Kaministiquia Power capital stock, and Canadian General Electrics are harder. On the other hand, the Mexican group is very dull. Several of the bonds in the utility companies are lower, the falls ranging from 1 to 3 points. The news from Mexico is far from encouraging; and although hope has not yet been lost, and optimists avow that Mexico stands upon the very eve of a turn in her fortunes, there are certainly no buyers of Mexican stocks. Per contra, if good news does come in, quotations will be restored with a rapidity even greater than that with which they fell; and the risky speculator has plenty of scope for his fancy in this department just now.

British Columbia Electric preference stock has fallen 3 points, and the yield therefore rises to over 9 per cent. on the money. The information which comes from Vancouver seems to suggest that British Columbia has so far missed its proper share of the more cheerful financial conditions that prevail in Canada, as compared, say, with a year ago.

In the foreign section, Brazilian Tractions have fallen back to 49¾, two or three hundred shares coming to market and finding no willing home awaiting them. Anglo-Argentine Trams second preference rose to 3¼, and the remaining issues in this group are steady. The Telegraph market is irregular. Great Northerns are 5s. better, and Anglo-American preferred gained a point to 101½—this, by the way, being the price which the Treasury is bidding for New York Telephone 4½ per cent. bonds. Oriental Telephones have weakened, the price going back 3s. 9d. on the offer of shares the other day. Marconis are dull at 37s. 6d., the subsidiaries being also inclined to weaken after their recent spurt. Globe ordinary at 10¼ are the fraction down.

Amongst manufacturing shares, British Westinghouse preference are prominent with a rise of 2s. to 2¼, more than recovering their reaction of last week. Callenders gained ¼, and Edison & Swan fully-paid shares rose 5s. to 1¼, although the partly-paid at 7s. are a trifle lower. Babcock & Wilcox declined 1/16, while other iron and steel shares are mainly good.

The price of copper had a dramatic jump of £4 a ton on Tuesday morning, and this brought about a sharp rise in the prices of most copper shares. The rubber market exhibits noticeable strength, and there is still a remarkable amount of business doing, the demand for shares coming from all parts of the country. The spring reports of the companies and the final dividends are sure to make good reading for the shareholders, and it is largely upon the strength of expectations connected with these that the market is so hard in tone.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Month ended (4 wks.)	Receipts for the month.		No. of weeks.	Total to date.		Route miles open.	
		£	£		£	£		Inc.
Blackpool-Fleetw'd	Jan. 29	1,356	+ 111	4	1,356	+ 111	8	..
Bristol (Trams) ..	„ 28	18,605	+1,073	4	18,8 5	+ 1,073	90·5	..
Cork	„ 27	1,792	+ 78	4	1,792	+ 78	54·25	..
Dublin	„ 28	24,149	+1,840	4	24,149	+ 1,840	9·89	..
Hastings	„ 28	756	+ 263	4	756	+ 263	19·8	..
Lancashire United	„ 26	6,705	+ 507	4	6,196	+ 4·2	42	..
Llandudno-Col. Bay	„ 28	759	+ 86	8	1,575	+ 116	6·5	..
Tyneside	„ 19	1,927	— 81	3	1,382	— 69	11	..
Anglo-Argentine ..	„ 29	196,071	—6,691	4	196,071	— 6,691	..	..
Auckland	„ 17	21,801	- 1,390	42½	125,810	+ 908	25·42	1·08
Calcutta	„ 29	18,9 8	+1,16)	4	18,958	+ 1,169	..	..
Kalgoorlie, W.A. ..	Nov.	2,811	..	48	30,402	..	..	..
Madras	Jan. 31	4,425	+ 593	4	4,425	+ 593	..	..
Montevideo ..	Jan.	84,252	+1,793	13	93,961	+ 5,818	..	..
Dublin-Lucan Rly.	Jan. 28	458	— 5	4	458	— 5	7	..

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend, 1914.	Price Feb. 8, 1916.	Rise or fall this week.	Yield p.c.
Home Electricity Companies.				
Brompton Ordinary	10	7½	—	£3 18 4
do. 7 per cent. Pref.	7	7	—	5 0 0
Charing Cross Ordinary	5	3⅝	—	7 2 10
do. do. do. 4½ Pref.	4½	3½	—	6 0 0
do. do. City Pref.	4½	3	—	7 10 0
do. 4 Deb.	4	75	—	5 6 8
Chelsea	5	4	—	6 5 0
do. 4½ Deb.	4½	87	—	5 3 6
City of London	9	12½	—	7 7 3
do. do. 6 per cent. Pref.	6	11	—	5 9 1
do. do. 5 Deb.	5	98	—	5 2 0
do. do. 4½ Deb.	4½	85	—	5 6 0
County of London	7	10	—	7 0 0
do. do. 6 per cent. Pref.	6	10½	—	5 17 3
do. do. 1st Deb.	4½	85	—	5 5 0
do. do. 2nd Deb.	4½	88	—	5 8 0
Kensington Ordinary	9	6	—	7 10 0
London Electric	4	1⅜	—	8 8 4
do. do. 6 per cent. Pref.	6	4½	—	7 1 2
do. do. 4 Deb.	4	75	—	5 4 0
Metropolitan	3½	2½	—	7 15 7
do. 4½ per cent. Pref.	4½	3	—	7 10 0
do. 4½ Deb.	4½	85	—	5 6 0
do. 3½ Deb.	3½	70	—	5 0 0
St. James' and Pall Mall	10	6	—	8 6 8
do. do. do. 7 per cent. Pref.	7	6	—	5 16 8
do. do. do. 3½ Deb.	3½	70	—	5 0 0
South London	5	3½	+ ⅜	6 8 0
South Metropolitan Pref.	7	1 3/16	—	6 14 0
Westminster Ordinary	9	6	—	7 10 0
do. 4½ Pref.	4½	4	—	5 12 6
Telegraphs and Telephones.				
Anglo-Am. Tel. Pref.	6	101½	+1	5 18 6
do. Def.	88/6	21½	—	7 14 3
Chile Telephone	8	6⅜	—	6 10 8
Cuba Sub. Ord.	5	7⅜	—	6 9 0
do. Pref.	10	14½	—	6 18 0
Eastern Extension	7	12⅝	—	*5 5 0
do. 4 Deb.	4	75	—	5 6 8
Eastern Tel. Ord.	7	126½	—1	*6 6 0
do. 8½ Pref.	8½	64½	—	5 8 6
do. 4 Deb.	4	75	—	5 6 8
Globe Tel. and T. Ord.	6	10½	— ¼	*6 12 6
do. Pref.	6	10½	—	5 17 1
Gt. Northern Tel.	22	34	+ ½	6 8 6
Indo-European	13	49	—	6 15 4
Marconi	5	1⅞	— 1/16	5 6 8
New York Tel. 4½	4½	101½	— ½	4 8 4
Oriental Telephone Ord.	10	1½	— 1/16	5 18 6
do. Pref.	6	⅜	—	6 17 2
Tel. Egypt Deb.	4½	80	—	5 0 0
United R. Plate Tel.	1½	5⅞	—	*7 19 0
do. Pref.	5	4⅝	—	5 8 1
West India and Pan.	1	1⅛	—	8 17 9
Western Telegraph	7	12⅞	—	*6 4 6
do. 4 Deb.	4	77	—	5 4 0
Home Rails.				
Central London, Ord. Assented	4	69	—	5 16
Metropolitan	1½	24½	— ½	5 2
do. District	Nil	15	—	Nil
Underground Electric Ordinary	Nil	1⅛	—	Nil
do. do. "A"	Nil	6/6	—	Nil
do. do. Income	6	8½	+ ½	*8 3 0
Foreign Trams, &c.				
Adelaide Sup. 6 per cent. Pref.	6	5	—	6 0 0
do. 5 Deb.	5	96	—	5 5 0
Anglo-Arg. Trams, First Pref.	5½	4¾	—	6 13 6
do. 2nd Pref.	5½	8½	+ ½	7 17 2
do. 4 Deb.	4	71⅝	—	5 12 8
do. 4½ Deb.	4½	77	—	5 17 0
do. 5 Deb.	5	80	—	6 5 0
Brazil Tractions	4	4⅞ xd	— 2⅛	8 0 6
Bombay Electric Pref.	6	10 xd	—	6 0 0
do. 4½ Deb.	4½	85	—	5 8 0
British Columbia Elec. Ry. Pfce.	5	55	—3	9 1 10
do. do. Preferred	—	37	—1	Nil
do. do. Deferred	—	8½	—	Nil
do. do. Deb.	4½	64	—	6 12 10
Mexico Trams	Nil	38	—1	Nil
do. 5 per cent. Bonds	—	42	- 3	Nil
do. 6 per cent. Bonds	—	57	—1	Nil
Mexican Light Common	Nil	29	—	Nil
do. Pref.	Nil	58	—	Nil
do. 1st Bonds	—	42	—3	—
Manufacturing Companies.				
Babcock & Wilcox	14	2⅝	— 1/16	5 6 8
British Aluminium Ord.	5	22/6	—	4 9 0
do. Pref.	6	18/-	—	6 13 4
British Insulated Ord.	15	10½	—	7 2 10
do. Pref.	6	5½	—	5 11 7
British Westinghouse Pref.	7½	48/-	- 2/-	6 13 4
do. 4 Deb.	4	69	—	5 14 10
do. 6 p. lien	6	101	—	5 19 0
Callenders	15	11⅜	+ ¼	6 11 10
do. 5 Pref.	5	4½	—	5 17 8
do. 4½ Deb.	4½	90	—	5 0 0
Castner-Kellner	20	8½	—	6 8 0
Edison & Swan, £3 pd.	Nil	7/-	- 6d.	Nil
do. do. fully paid	Nil	1½	+ ½	Nil
do. do. 4 Deb.	4	60	—	6 13 4
do. do. 5 % Deb.	5	60	—	8 6 8
Electric Construction	6	15/-	—	8 0 0
do. do. Pref.	7	1	—	7 0 0
Gen. Elec. Pref.	6	9½	—	6 3 1
Henley	20	13½	—	*8 6 2
do. 4½ Pref.	4½	4½	—	5 6 0
do. 4½ Deb.	4½	92	—	4 17 9
India-Rubber	10	9½	—	*12 19 0
Telegraph Con.	20	36	—	*7 12 6

* Allowance made for dividends being paid free of income-tax.

The Batti-Wallahs.—The committee of the Batti-Wallahs' Society is calling an informal meeting of the society for Friday, February 25th, at 6 o'clock for 6.30, at the Victoria Mansions Restaurant, Victoria Street, S.W. The usual informal meal will be followed by a concert.

NOTES ON ELECTRIC WELDING PRACTICE.

(*Continued from page* 133.)

Clamping.—The question of the arrangement of the clamping jaws is important in any butt welding operation. The jaws have necessarily to be heavy and to have large contact surface to carry the heavy welding current without overheating themselves or the work. On the other hand, their considerable mass and clamping surface offers a ready path for escape of heat by conduction from the weld, and a certain projection of the work is desirable to hasten and localise heating and save current. If the nature of the work demands support close up to the joint, the current used must be heavier to "overtake" the more rapid cooling.

Wrought iron or mild steel bars of equal section each project ¼ to ⅜ of their diameter if the weld is to be made on the impact or flash principle, but if a boss is to be built up, more extensive heating is required, and each rod projects ½ to ¾ diameter. Copper and brass, owing to their high thermal conductivity and the greater amount of stock absorbed in the weld (due to the metal being practically molten at the moment of upsetting), must project considerably more than iron—say, 1½ to 2½ diameters for copper and rather less for brass. A weld in small copper wire may take up 1 diameter or more of stock.

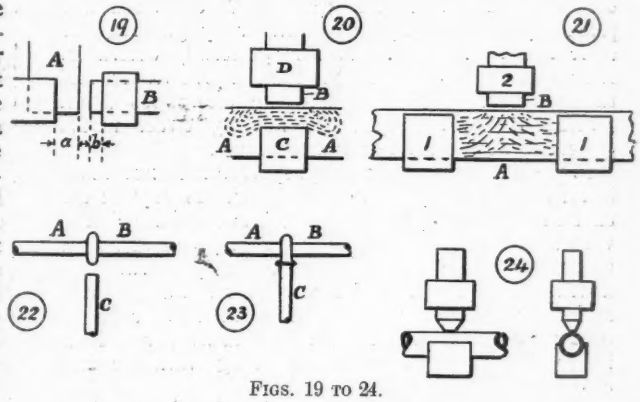
In order that both pieces welded may reach welding heat at the same moment, it is necessary that the relative cooling facilities be the same for each, and this is particularly important where copper, aluminium or brass are concerned, for the weld must then be completed directly welding heat is reached. It therefore follows that if one piece is of larger section or of more highly conducting metal than the other, it (the first) should project further from the jaws. The projection is roughly proportional to sectional area of work in the case of unequal sizes of the same metal; and where different metals are concerned compensation should be made by projection or sectional area (or both) for differences in thermal conductivity. The conductivity of copper being about six times that of wrought iron, the copper should project say three times as far as the wrought iron in case of a weld being desired between the two. If possible, the section of the copper should be reduced as well. To secure correct degree and timing of heating, a low carbon steel to be welded on to a high carbon steel should project 2½ or 3 times as far as the latter—say, 1¾ and ⅜ diameter respectively.

The procedure in practice is to set up two pieces with approximately correct actual and relative projections as determined by experience, and then to make a trial weld, noting the time taken to attain welding heat and the uniformity of heating, etc. Locating stops and upsetting springs or weights being once adjusted, their setting should be noted for future guidance, and repetition work can be at once commenced. Tables or charts can be drawn up to facilitate adjustments for given classes of work.

In cases other than that of simple end to end welding of round or rectangular stock, the disposition of the jaws is of even greater importance, and it is sometimes necessary to employ auxiliary heating to allow for the greater mass or conductivity of one piece. Typical examples of the kind of problem involved are illustrated by figs. 19-21. In the case of the simple right angle corner weld a projection ratio (a/b) of 2:1 will generally allow for the easier escape of heat along A as compared with B. A tee-joint offers yet greater opportunity for heat escape along A (fig. 20) as compared with B, and, unless the jaw C is comparatively near that edge of A remote from B, the zone of heating is as dotted due to lateral conduction in A and heat absorption by C. A simple means of getting over the trouble is to use three jaws as in fig. 21, first passing current between 1, 1 till the piece A is sufficiently preheated, and then passed between 2 and 1, 1 to complete the weld. This course is practically essential if the piece B is considerably lighter in section than A. The two current distributions may be effected by a 2-way switch, or two distinct transformers may be used as shown diagrammatically in fig. 25, if the nature and amount of work justifies the construction of a special machine. The sketch is self-explanatory, the essential feature being the use of two transformers, S T, to preheat the heavier piece and weld on the tee-piece respectively. In the past gas flames have been used for preheating, but, except for filling-in or building-up work using arc equipment, it is difficult to conceive any case to which electric preheating-clamps cannot be applied advantageously.

Building up a tee-piece from three separate pieces is easily effected by a 3-jaw arrangement, as in figs. 22, 23. The pieces A, B are first butt-welded, and incidentally preheated for the second operation of welding C into the first-formed burr.

The question of jaw or electrode shape is closely associated with that of clamp arrangement, and, whilst demanding special consideration for each case is solved by application of the general principles already enunciated. For ordinary butt welding the clamping jaws have to represent a compromise between massiveness required to carry very heavy currents and lightness required to reduce heat abstraction from the work; from the mechanical standpoint, they must admit quick insertion and removal of work, and transfer sufficient clamping and lateral force to the latter without injuring its surface. To



Figs. 19 to 24.

hold strips (or the ends of hoops) which are wide for their thickness, in exact alignment, serrated intermeshing jaws may be used, these supporting the work practically at its edge yet permitting more rapid and even heating than straight-edged jaws. In spot or seam-welding the bearing surface of the two electrodes may be unequal to allow for difference in section or conductivity of the pieces joined. For instance, using a truncated cone or electrode against spot or seam-welding, the bearing surface of the two sheets, the sheet of higher conductivity would be placed on top. Similarly, a conical and troughed electrode combination, as in fig. 24, concentrates heat at the seam of a tube to be welded.

Preparation of Work.—Some of the work which should be done before starting to weld is, one might think, obvious, but it is not always performed. Before filling in blowholes by the arc process, the top of the hole should be opened out, so that the cavity is accessible to complete filling, and the interior surfaces cleaned thoroughly. Though butt welding on the "flash" principle expels automatically any reasonable amount of foreign material from the weld, it is unreasonable to deliberately leave the surfaces to be joined in a dirty state. A sandblast or grinding wheel, as may be most convenient, should be used to remove scale or oxide. Forging scale may be removed by a hot pickle of 1 : 50 volumes of sulphuric acid and water, followed by rinsing and dipping

in milk of lime. The gripping surface for the jaws (in butt welding) should be clean as well as the actual welding surface. By attending to preliminary cleaning overheating at the jaws is prevented, time and current are saved, and the risk of flaws is eliminated.

Something has already been said regarding electric preheating by resistance-heat; generally it is limited by considerations of cost to comparatively light pieces. Any piece which can be welded by the resistance process can, of course, be preheated by the same means, and having welded, say, a wheel tire, the whole of the latter can be heated electrically for shrinking-on purposes, conveniently and with

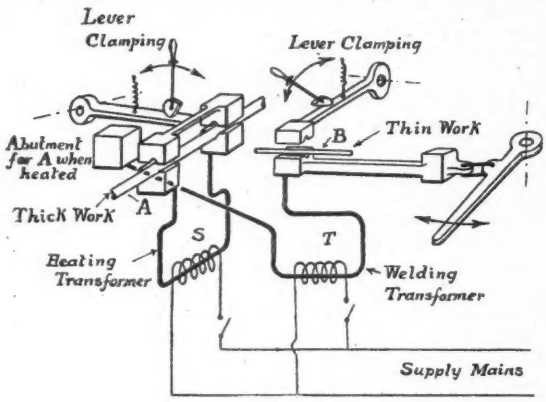


Fig. 25.

economy. In the case of castings or other massive pieces, preheating by gas-torch or by gas ring or coke fire or muffle furnace is generally desirable. Electric resistance welding is then impracticable, and though an arc between separate electrodes (*e.g.*, Voltex) could be used, the heating effect would generally be too intense and too local.

More or less mechanical preparation is necessary in all but the simplest welding jobs. Except in the case of very thin plates (to which arc welding is not very safely applicable), the edges of plates to be arc welded should be chamfered to ensure penetration of heat and added metal. To allow for the difficulty of sound welding throughout the thickness of a flange on a pipe, the former should be bored taper and the latter bell-mouthed, thus affording valuable mechanical support to the weld.

Various means of clamping and preheating to allow for inequality of section or mass in butt welding have been described, but best of all is to arrange that the sections welded are equal whenever possible. This can frequently be arranged either by preliminary

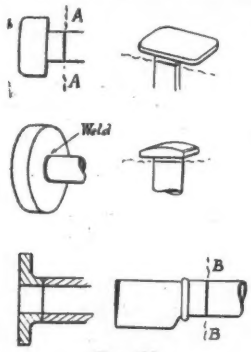


Fig. 26.

machining or by judicious selection of the position of the joint. For instance, in welding bolt heads to bar stock (to save machining the whole belt from the solid), the weld should not be at the base of the head itself: rather should the head blank be chosen large enough to permit ½ in. or so to be turned down to the bolt diameter, the weld being then made on the end of the stub so formed (A, fig. 26). Not only is the ease and reliability of welding thus increased, but cleaning up the finished joint is facilitated.

Similarly, the joint between a knife and metal handle should be made at B B, fig. 26—where there is uniform section on either side, and the small welding fin is easily ground off.

(To be continued.)

MODERN PRINTING TELEGRAPHY.

On January 27th Mr. H. H. Harbison, A.M.I.E.E., read a paper before the Institution of Electrical Engineers on the principles of modern printing telegraphy, in the course of which he reviewed the history of the subject, and described the essential features of the various systems that have been evolved. The system invented by David Hughes in 1854 was the first to achieve permanent success, and was followed by the Baudot multiple system 20 years later. The broad principles on which a printing telegraph should be designed were first clearly defined by Donald Murray, in his classic paper read before the Institution in 1905. Almost all inventors of modern systems have adopted the five-unit alphabet, with the result that the devices employed by them follow similar lines. A fundamental requirement for success is that the operation of the system shall not depend upon the strength, but the direction of the received current, unless, as in the case of a submarine cable, the line is far removed from external electrical disturbances. By varying the number, duration, or moment of appearance of the signal elements a single wire can be employed to transmit impulses which select the desired characters, cause them to be printed on a tape, and advance the tape for the next letter.

Using the five-unit system, means have been devised to enable each combination of signals representing a letter to be dispatched by the simple depression of a key, as in ordinary typewriting; but in order to avoid loss of time due to other necessary operations it is found better to store the signal permutations so that the line can be kept working whilst the operator is otherwise engaged, rather than to send the signals direct to line as formed. The usual method of storage is by causing the depression of each key to perforate a paper tape in a corresponding manner, the tape being then fed into a mechanical transmitter. Arrangements have been devised for enabling errors in keying to be obliterated without affecting the receiving apparatus, and for stopping the transmitter when it outruns the perforating mechanism, in order to avoid tearing the tape. The transmitter is automatically started again directly the operator catches up with it by a device due to Murray. At the receiving end the signal sequences are stored, and combined to set the printing wheel, which then prints the proper character, and the mechanism is automatically reset for the next letter. Ingenious devices have been developed to enable the printing to be effected either on a tape, on a continuous web of paper, or on separate pages, which are automatically fed into the mechanism; not only so, but the sender can ensure starting each message on a fresh page, and the mechanism even sends him a warning signal when a page is full.

For circuits carrying comparatively little traffic, the single-channel low-speed step-by-step printer, using the Baudot alphabet, and perforated tape, and manually-operated, is quite suitable. Several systems are described by the author, including one of his own invention. A feature worthy of note in single-channel printers is that in order to give time for printing a letter without delaying the working of the system, two groups of setting magnets can be employed, so that while one character is being printed the next can be prepared. This is known as the "overlap" principle.

All modern high-capacity systems depend for their operation on the maintenance of synchronism between rotating mechanisms at both ends of the line, which involves two main requirements—the maintenance of uniform angular velocity of the rotary devices, and the maintenance of a definite phase relationship between the sending and receiving apparatus. Numerous devices have been worked out for these purposes, and are described by the author. Usually a shunt-wound electric motor is the driving agent, and is provided with a fly-wheel with special fluid damping features.

Speed governing is effected with the aid of a tuning-fork, so connected with regard to the motor that resistance in series with the armature is periodically short-circuited for longer or shorter periods and the speed maintained constant. The "phonic wheel" of Rayleigh and La Cour, which consists of an iron star-wheel kept in rotation by alternating currents supplied by means of a vibrating reed, makes a most satisfactory and reliable motor of constant speed. To keep the sending and receiving apparatus in step with one another, one is made the controller and the other is adjusted to run slightly faster or slower; means are then provided for automatically correcting the phase of the latter whenever it departs

from exact agreement by a known amount. The corrections can be generated by the signals themselves; several methods of doing this have been devised and are described.

Th last section of the paper deals with modern developments, tending to economise time and plant. The high-speed one-channel apparatus is known as "automatic," and the low-speed multi-channel apparatus "multiplex," but in many respects they are identical. The latest high-speed system is capable of printing 1,000 letters per minute without blurring, the paper being struck against the type-wheel by an electro-magnetic hammer which is actuated by a condenser discharge. The printing time in any multiple system does not involve waste of line time, so that overlap is not necessary; the line is practically placed at the disposal of one, two, or more, up to five or six, operators in succession for the transmission of signals, by the rotation of distributors divided into sectors. As the signals may be sent in either direction, by each channel, it is evident that a variety of combinations of traffic can be made. Here a difficulty arises on long lines, due to the appreciable lag of the incoming signals, so that they begin to encroach on the outgoing signals, and special means have to be adopted for dealing with this trouble, which reduces the efficiency of line use; in fact, if the lag is serious, it is preferable to use separate lines for up and down traffic. The signals can be automatically repeated at intermediate stations, and as distortion of the signals results from repeated repetitions, they can also be retransmitted in as perfect a form as that in which they were first dispatched, and this process greatly increases the flexibility of the multiplex telegraph.

The author concludes that the five-unit equal-letter alphabet now holds the field, and that high-capacity systems transmitting letter by letter at 40-45 words per minute per printer unit can be made of strong construction and at diminishing first cost. Except where saving of line time is of the first importance, it is better to provide special segments for the correcting impulses rather than to correct by the signals themselves, the former method having the advantage of automatic phase-finding. On the less important circuits the type-wheel tape printer of low first cost has a large field, but for the high-capacity circuit the page printer holds undisputed sway.

In the discussion which followed the author received many congratulations on the comprehensive character of his paper, which Mr. DONALD MURRAY regarded as sufficiently detailed to enable any competent engineer to construct such apparatus.

In opening the discussion, Sir WILLIAM SLINGO pointed out that printing telegraphy had been hindered in its early stages by conservative feeling, but its increased legibility, saving in time of transcription, &c., were now appreciated, and it was now a question of high-speed automatic *versus* multiplex working. He noted the absence of reference to photographic methods, which the author subsequently discounted from a practical standpoint, and discussed at some length the Siemens automatic system, which, he said, attained a working speed of 166 words a minute, but Mr. Harrison did not think this speed would be maintained in practice. The Morse code was not twice as long as the five-unit code, the proportion being 8 : 5. He disagreed with some of the author's conclusions, and thought that page printing would in the end prove more satisfactory than tape printing.

Col. SQUIER urged telephone and telegraph engineers to draw freely on wireless developments with a view to improving their art, while Mr. WALTER JUDD pointed out that the Eastern Co.'s long-distance cables were fitted with the Creed system and perforators; all messages were printed off ready for delivery in the city.

Mr. DONALD MURRAY pointed out by comparison with the interconnected electric supply system on the N.E. Coast (see ELEC. REV., page 28) that a great deal remained to be accomplished before a paper on printing telegraph networks could be written. Mr. RAYMOND-BARKER suggested that to complete the comparison of telegraphic codes, a graph of the cable code should be added; the word "London" would represent 49 units as against 69 units with Morse, and Major BOOTH, referring to the same comparison, said the results could not be taken as an indication of value for line working; he thought Mr. Murray had been surprised to see the Hughes instrument printing as fast as his up-to-date apparatus, but it was illegible. He also doubted whether any ordinary type-writing mechanism would stand the high speeds of modern telegraphy.

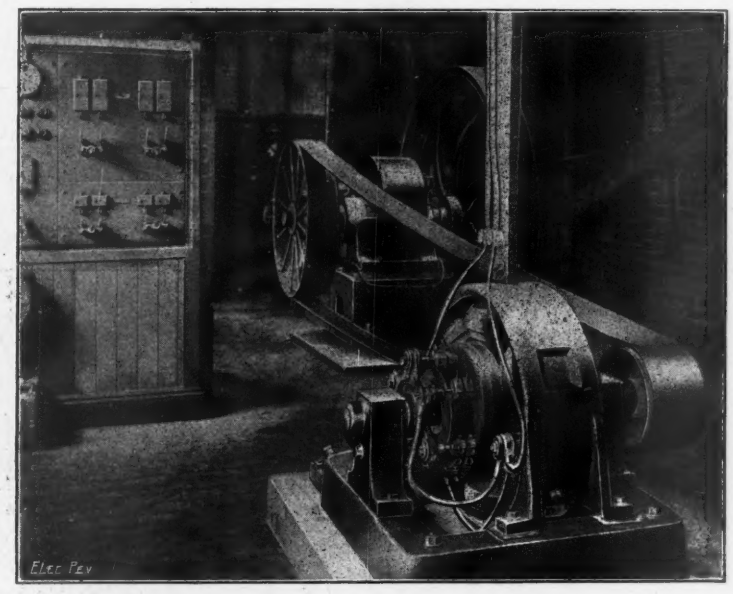
Mr. TYRRELL mentioned the reliability of the Baudot apparatus at Antwerp just at the time of its surrender, and despite the efforts made to interfere with the working; he pointed out, in reply to Sir William Slingo's suggestion that printed messages would not have been trusted 20 years ago, that many thousands of printed telegraph messages were being distributed in the city, to stockbrokers and others, quite 30 years ago.

THE "MACHINERY AGE" IN FARMING.

AN interesting review of the economic conditions which will confront the British farming community after the present war—and which are even now influencing this industry—was contained in a paper presented at the last meeting of the Farmers' Club in London recently, by Mr. W. J. MALDEN. The theme of both the paper and discussion which followed it, was the inevitable necessity of meeting the deficiency of manual and animal labour by the introduction of power-driven appliances on a wholesale scale, particular stress being laid on the value of the oil motor for ploughing and other purposes.

It is not for us to discuss the pros and cons of oil or steam power on the farm, but rather to point out that at the best, either is merely a stepping-stone to the use of electricity for all farm purposes: for power, traction, light, intensive cultivation of crops, poultry incubation, and the production of artificial fertilisers. At present the farmer is groping in the dark, and we share with the author his difficulty in understanding why the Board of Agriculture should not employ the highest engineering skill, as well as the best chemical, veterinary, bacteriological, and poultry experts. Assuredly there is need of expert guidance to ensure that the future of agricultural engineering generally shall not be wrecked on a side issue.

We have previously drawn attention to this subject* and urged on the Board the necessity of opening an inquiry into the subject of agricultural electric supply generally, with a view to studying our national requirements in this connection, because sufficient evidence has been obtained to place beyond doubt the utility of electrical methods on the farm, and, furthermore, because the economic prosperity of the country demands that steps shall be taken to co-ordinate our industrial operations, particularly where they can be made interdependent and mutually helpful to one another. Although, judging from the remarks made by Mr. Malden, one might almost assume that an oil or petrol motor-driven tractor for ploughing, or other purposes, represents the panacea for all present and future farming troubles, and that the newly-discovered adaptability of this type of machine is such as to discount experiment in other directions, yet he himself admits that the (oil) motor is in a comparatively crude form, and that whether it would be so valuable in cultivating small British fields in a climate so wet as ours, and where so much land is on the heavy side, as a tractor or windlass hauler—avoiding the necessity of running heavy engines over land after it has been ploughed—has yet to be proved.

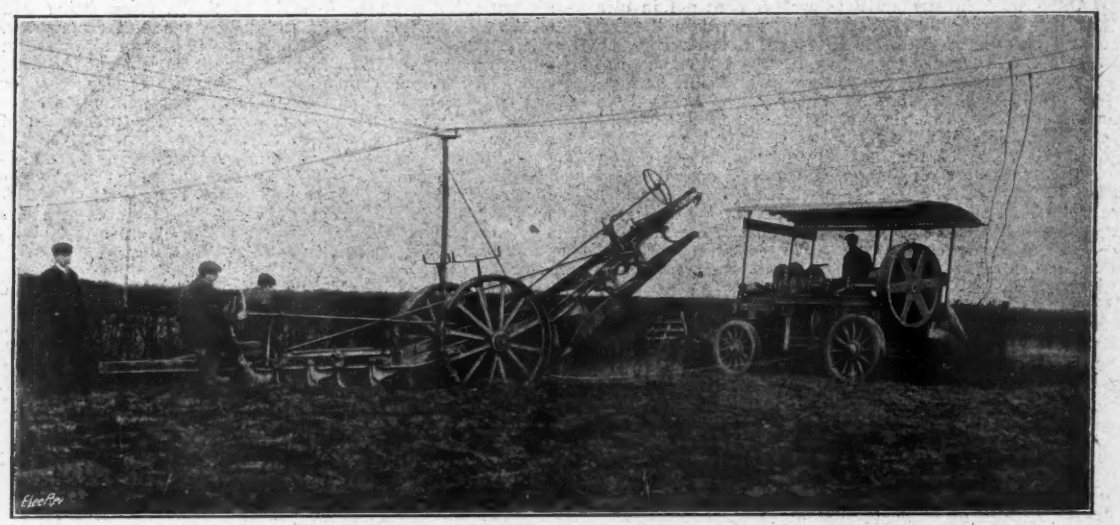


GENERATING PLANT ON A NOTTINGHAMSHIRE FARM.

We have touched on this matter because it would be a great mistake to defer consideration of the known utility of electrical methods generally on the farm, solely because an unproved oil or petrol tractor for ploughing and haulage has made its appearance, especially as electrical ploughing has distinct possibilities of its own. Experimental electric ploughing on an extensive scale has taken place in several European countries with favourable results in comparison with steam and oil power; in Germany a number of electric ploughing equipments are in operation, while in this country we can point to a small Nottinghamshire farm—to which we refer later on—which has depended on electricity for ploughing, thrashing, and power and lighting generally, for several years past, apparently with satisfaction to the owner.

* ELEC. REV., December 3rd, 1915, page 739.

Given suitable recognition of the utility of electrical methods on the farm, the apparent obstacle of the moment—the lack of supply facilities in agricultural areas—could be easily overcome, especially in the neighbourhood of the established supply undertakings which, as has been shown in our pages, are sufficiently numerous and widespread to cater for the initial requirements of any general scheme for farm and village supply. We have it on the authority of Mr. Malden's paper that an almost unlimited number of "motors" (oil or petrol engines and tractors) could be sold to the farming community at the present time—in fact, the machinery age in farming has arrived, and, despite the difficulties which beset us at the moment, the present is a golden opportunity which may not occur again to introduce power appliances to the farmer and one which electrical engineers and electricity suppliers would do well to seize on with a view to the future development of electricity supply in the hitherto neglected agricultural districts.

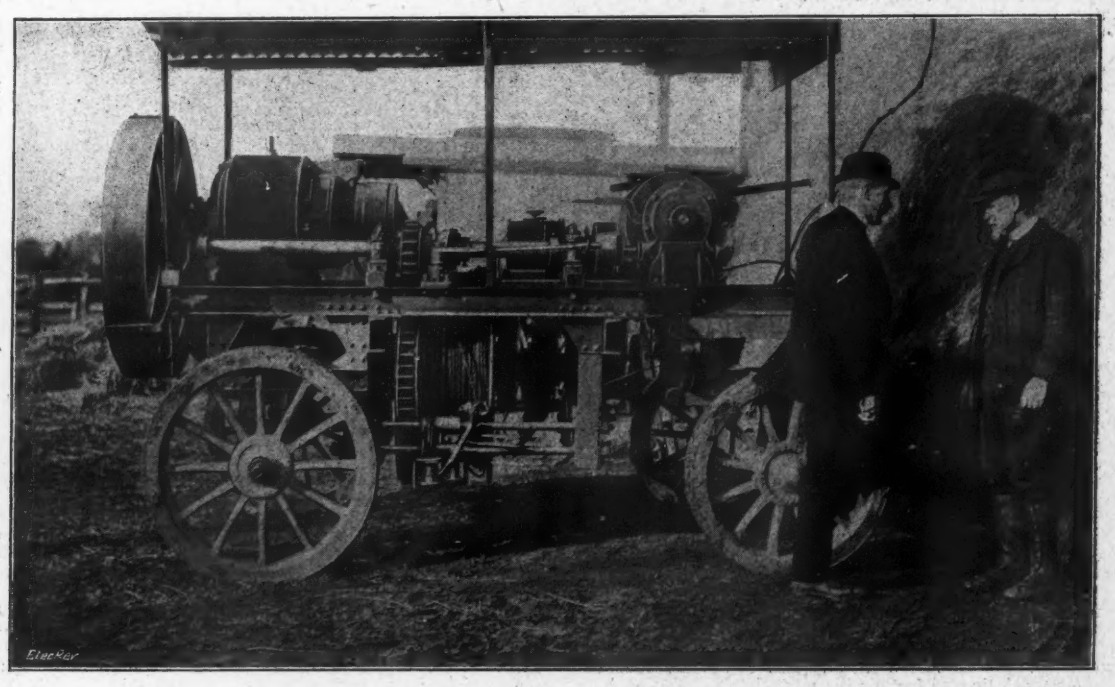


Electrically-operated Plough, with Haulage Trolley, Overhead Wires, &c.

tackle overcame this difficulty it introduced others equally serious—the ploughing engine being too heavy to run over the land in wet weather, and in any case requiring the services of two or three men and a horse to carry fuel and water, in addition to three men working the ploughing tackle.

Mr. Chorlton called in Messrs. E. O. Walker & Co., engineers, of Manchester, who designed and installed the equipment which has been in use since 1910. This consists of a 25-h.p. suction gas engine, with producer, &c., driving by means of a belt a 500-volt direct-current dynamo, this plant being installed in an outbuilding at the farm, where it supplies electric lighting and local power requirements. In addition, this plant supplies overhead distribution wires, which are carried on poles to various parts of the farm, and which supply the electric ploughing tackle in the field.

The ploughing gear is on similar lines to steam ploughing tackle, consisting of two special trolleys carrying electrically-driven haulage gears, which are placed at opposite sides of the field and haul a reversible three-furrow plough to and fro between them by means of a wire cable; the haulage trolleys are moved on a short distance after each successive journey of the plough, a cable drum being fitted to the trolley for this purpose, the cable of which is anchored at the farther end of the field. It will be noted in our view of the plough at work that the overhead wires are tapped by flexible cables arranged to hook over and slide along them.



Haulage Trolley fitted with Electric Motor and Pulley for Belt Driving.

Electricity on a Nottinghamshire Farm.

Some five years ago, a Mr. Chorlton conceived the idea of introducing electrical methods at his 240-acre farm at Cotgrave, near Nottingham, more particularly with a view to overcoming ploughing difficulties arising from the heavy clayey nature of the land, which had necessitated the use of three and four horses to pull the plough through a furrow, resulting in excessive puddling of the latter. While steam ploughing

Originally a double-ended five-furrow plough was in use, but this has been superseded by a lighter double-ended three-furrow plough in view of the experience gained; as regards the matter of experience, Messrs. Walker found it necessary to experiment in the first instance with a two-horse plough fitted with a dynamometer, in order to obtain some idea of the tractive effort required. In the case of the tackle actually employed now, the hauling rope, about 400 yards long, weighs about half a ton, and a pull of up to five tons is required when hauling up hill. It may be added that the 25-H.P. gas engine requires some coaxing before it will take the load after it has been running light, while the ploughing tackle is being adjusted; but despite this—and contrary to the views held before the installation was put in, that a 25-H.P. plant would not pull a single-furrow plough—it is found possible to pull three shares through the heaviest and stickiest clay, ploughing three furrows 8 in. or 9 in. deep and 9 in. or 10 in. wide.

The haulage trolleys weigh about 4 tons each, and they are employed where possible to pull each other on heavy land, but experience shows that they can be greatly improved by making them self-moving in future.

It is obvious that with electric power available in different parts of the farm, many operations can be facilitated by its use.

The electric motors on the haulage trolleys are provided with pulleys providing for a belt-drive to any type of machine,

Threshing Machine Electrically Driven from Haulage Trolley.

and one of our views shows a thrashing machine being driven in this way. Harrowing, mowing, cutting drains with the implement already used with steam ploughs and any other operation done with steam ploughing tackle can be done with the electric tackle used on Mr. Chorlton's farm. We understand that this gentleman is well satisfied with his installation, which is run by farm hands—the farm foreman being the chief engineer. We may add that a field, 280 by 280 yards, of heavy clayey soil has been ploughed to a depth of 8 in. with a coal consumption of 1¼ tons; obviously the cost would be less were it possible to obtain electricity at power rates for ploughing, and Messrs. Walker estimate that nine miles of single-furrow could be cut per hour at a cost for energy of 4d. on the basis of ½d. per unit, or *pro rata* for higher prices.

We are indebted to Messrs. E. O. Walker & Co. for the particulars of this installation; we have also drawn on a short article published in the *Manchester Guardian*, through whose courtesy we are enabled to publish the accompanying views.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Electric Iron Connections.

We understand that one of your interested readers a few weeks ago made reference to the unsatisfactory flat-iron connector which he had been in the habit of using. We should specially like to draw your attention to the sample connector which we are taking the liberty of sending to you, and would bring to your notice the specially prepared flexible wire, which we use together with the special fibre bar attached to the connector. By this arrangement all the strain is taken from the actual connection, and, further, practically no heat touches the flexible cord itself. Again, it will interest you to note that there are four points of contact on each terminal.

Hotpoint Electric Heating Co.,
L. G. Hawkins.

London, W., *February 3rd*, 1916.

[The connector referred to is certainly a very good one, which ought to give very little trouble.

We drew attention to this connector in our issue of November 27th, 1914, when writing of the "El Radio" radiator, without, however, giving details.—Eds. Elec. Rev.]

The I.E.E. and Alien Enemy Members.

With reference to the correspondence in your columns regarding the Institution of Electrical Engineers and Alien Enemy Members, all those who wish this matter settled in the only patriotic and reasonable way should refuse to pay their subscriptions until the matter is properly dealt with.

May I, at the same time, ask the following questions:—

What are the advantages of being a member of the Institution in any grade?

What inducement is there for a student to apply for transference, with its fee and extra subscription?

What has the Institution done to assist young, struggling engineers to earn a sufficient salary to meet such new liabilities?

Admitted there are the lectures and the lending library, but, apart from these, it seems to me that the advantages are nil.

The Institution is closed, or, at least, the library is, during the hours when most members of the electrical profession can visit it, and it is impossible for a student to use the library to his advantage.

Is it correct that members of the Council have facilities for dining on the Institution premises? and what would happen to the student who took his frugal lunch to consume on the Institution premises?—yet his 1½ guineas is more to him than the higher subscription to the member.

What is needed is an Institution on the lines of the American Westinghouse Electric Club.

A Student.

February 6th, 1916.

With reference to the letter of "Alien-ate(r)" in your issue of February 4th, we shall be glad to receive the support of other members if you will be good enough to accept them.

The dastardly air raid of January 31st should assist in enforcing our demands.

Six Borough Electrical Engineers.

February 7th, 1916.

[An important decision of the Council of the Institution will be found in our "Notes" section.—Eds. Elec. Rev.]

B.E.A.M.A.—The following firms have been elected members of the B.E.A.M.A.:—Ferguson, Pailin & Co., Openshaw; Mirrlees, Bickerton & Day, Ltd., Hazel Grove, near Stockport. Callender's Cable and Construction Co., Ltd., has been elected a member of the Council for the session.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

EGYPT.—Revised tariff valuations for use in assessing import duties on certain metals have been issued, with effect from December 1st, 1915, to January 31st, 1916, or until denunciation, as follows:—

	Valuation per kilogramme. Millièmes.
Copper and brass sheets, round and bottoms	114
Copper sheets, plain	111
Copper sheets in rolls, bars, round and flat	111
Copper ingots	108
Copper wire	*ad valorem.*
Brass wire	,,
Brass sheets, plain, 24 by 48, 8 lb. to 5 lb.	,,
Tin ingots and bars	168
Lead sheets	31
Lead shot	32
Lead pipe	31
Lead, pig	31
Zinc sheets	105
Zinc ingots	105
Phosphor bronze	105
Antimony	130
Quicksilver	600

Duty is leviable on the valuations shown at the rate of 8 per cent. (1,000 millièmes = £E1 = £1 0s. 6d.)

SWEDEN.—The Board of Trade have compiled a list of articles which are at present prohibited to be exported from Sweden in virtue of a series of Swedish Royal Decrees issued since August, 1914. The following are included in the list:—Galvanic batteries; carbon electrodes; electro-magnetic igniting apparatus for motor ignition, detached; ferro-chrome; ferro-manganese and spiegeleisen; ferro-tungsten (ferro-wolfram) and ferro-vanadium; ferro-silicon and ferro-silico-manganese.

Copper and alloys thereof with zinc, tin, or other non-precious metal, such as brass, bronze, German silver, Britannia metal, etc.; also aluminium, nickel, chrome, and antimony:—

Unmanufactured or in the rough (including refined copper produced from raw material (not from scrap) at a Swedish refinery).

Anodes of copper, copper alloys and nickel, cast, even if with ears, with or without holes.

Scrap.

Copper and alloys thereof with zinc, tin, or other non-precious metal, such as brass, bronze, German silver, Britannia metal, etc.; also aluminium and nickel. Manufactures, viz.:—

Sheets and hoops:—

Rolled or pressed, even if with sheared edges (rectangular, and other kinds).

Hammered, bent, bell-shaped, with turned-up edges, including cup-shaped materials for making cartridges, etc., provided with holes, polished or otherwise worked.

Perforated sheets, including so-called strainer plates.

Rods (even if in bundles or coils), rolled, drawn, hammered or profile pressed, but not further worked, whatever be the shape of the section.

Solder, moulded, crushed, or granulated.

Nails and rivets; also bolts, wormed or not.

Pipes and tubes, whatever be the shape of the section, even if turned on the exterior and interior.

Wire, rolled or drawn, whatever be the shape of the section, including so-called trolley wire (contact wire).

Woven wire (gauze, wire tissue, etc.).

NOTE.—So-called wire gauze (endless) of nickel, and nickel wire tissue more than 1 metre wide are *not* prohibited.

Copper and alloys thereof with zinc, tin, and other non-precious metal, such as brass, bronze, German silver, Britannia metal, etc.:—

Wire twisted into cords or cables, not insulated.

Wire furnished with sheath of lead or other metal, with or without armouring, even if in combination with other materials; also electric cables or lines with similar sheaths, with or without armouring.

Wire insulated with rubber, gutta-percha, etc., even if in combination with other materials; also electric cables, lines, and cords insulated in this way.

Wire insulated with textile materials, paper, asbestos, or varnish, even if in combination with other materials; also electric cables, lines, and cords insulated in this way.

Wire, electric cables, lines, and cords insulated in any other way.

Rubber in various forms, viz.:—Rubbered plaster; rubber articles for medical or hygienic use; raw rubber, gutta-percha and balata, also so-called reclaimed rubber; rubber, in solution or in the form of paste (but not rolled into sheets or further manufactured), with or without admixture of other substances such as sulphur, graphite, and resin; also artificial soft rubber; manufactures of soft rubber, except driving and transmission belts, and except rubber boots and shoes; manufactures of hard rubber (ebonite, etc.), even if in combination with other materials; rubber waste and worn-out articles of rubber; rubber toys, and parts thereof.

Zinc:—

Unmanufactured (with the exception of zinc produced from raw material (not from scrap) at a Swedish refinery); also scrap.

Sheets, even with a coating of other non-precious metal.

Wire, pipes and parts of pipes; anodes, even if provided with ears, with or without holes.

Rolled sheets furnished with holes (so-called boiler zinc).

Rods.

NEW PATENTS APPLIED FOR, 1916.

(NOT YET PUBLISHED).

Compiled expressly for this journal by MESSRS. W. P. THOMPSON & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford.

1,076. "Vibrating diaphragms for telephones, transmitters, gramophones, &c." T. CHALMERS. January 24th.

1,097. "Lock-nuts, &c." MARCONI'S WIRELESS TELEGRAPH CO. January 24th.

1,098. "Automatic or semi-automatic telephone systems." RELAY AUTOMATIC TELEPHONE CO. & T. M. INMAN. January 24th.

1,116. "Means for placing collectors in contact with electric conductors." H. J. DOVER, VACUUM BRAKE CO., & W. P. WALKER. January 24th.

1,123. "Telephone systems." AUTOMATIC TELEPHONE MANUFACTURING CO. AND J. SAVIN. January 24th.

1,143. "Generator for electric oscillations or for alternating-currents of high frequency." F. W. LANCHESTER. January 25th.

1,157. "Electrolytic cells." C. CHURCHILL & CO. AND E. GEERAERD. January 25th.

1,183. "Apparatus for controlling electrical currents by rise and fall of temperature." A. J. BENNETT, W. BENNETT, & L. SANDOR. January 25th.

1,189. "Telephonic receiving apparatus for aviators." G. H. NASH AND WESTERN ELECTRIC CO. January 25th.

1,227. "Magneto-electric gun with propulsive retro-action." E. MERSCH. January 26th.

1,246. "Circuit controllers." CUTLER-HAMMER MANUFACTURING CO. AND IGRANIC ELECTRIC CO. January 26th.

1,247. "Resistance units, and manufacture thereof." CUTLER-HAMMER MANUFACTURING CO. & IGRANIC ELECTRIC CO. January 26th.

1,248. "Means for controlling electric circuits." CUTLER-HAMMER MANUFACTURING CO. & IGRANIC ELECTRIC CO. January 26th.

1,255. "Dynamo-electric machines." BRITISH THOMSON-HOUSTON CO. AND N. SHUTTLEWORTH. January 26th.

1,266. "Switch-operating mechanism." A. ROBERT & A. TANQUAY. January 26th.

1,271. "Electric glow lamps, electric arc lamps, electric heaters, &c." C. O. BASTIAN. January 26th.

1,278. "Electrolytic battery." MACKAY COPPER PROCESS CO. January 26th. (April 9th, 1915, U.S.A.)

1,282. "Arrangements for transmitting impulses." RELAY AUTOMATIC TELEPHONE CO. & L. C. BYGRAVE. January 26th.

1,287. "Joint box for armoured electric cables." H. HAIR. January 27th.

1,299. "Gas and electric globe gallery screw." T. CRACKNELL. January 27th.

1,309. "Means for supporting and insulating electric lines." BULLERS, LTD., AND G. V. TWISS. January 27th.

1,368. "Electric lampholder." A. H. SHORT. January 28th.

1,374. "Means for controlling and regulating electric motors." CUTLER-HAMMER MANUFACTURING CO. & IGRANIC ELECTRIC CO. January 28th.

1,381. "Electric accumulators." H. LEITNER. January 28th.

1,384. "Electric lamps." A. J. WEST. January 28th.

1,390. "Apparatus for observation of azimuth angles and simultaneous electrical transmission of value of such angles to remote indicators." E. A. GRAHAM & W. J. RICKETS. January 28th.

1,417. "Cores for Pupin loading coils, magnets, &c." WESTERN ELECTRIC CO. (Western Electric Co.). January 29th.

1,418. "Arc incandescent lamp for therapeutic, &c., purposes." E. A. GIMINGHAM. January 29th.

1,434. "Multi-speed alternating-current motors." BRITISH THOMSON-HOUSTON CO. (General Electric Co., U.S.A.). January 29th.

1,436. "Device for controlling electric ignition in internal-combustion engines." M. PENSUTI. January 29th. (February 3rd, 1915, Italy.)

PUBLISHED SPECIFICATIONS.

1914.

23,938. PERMANENT MAGNETS FOR ELECTRIC METERS. British Thomson-Houston Co. (General Electric Co., U.S.A.). December 11th.

24,659. AUTOMATIC MAGNETICALLY-OPERATED CLUTCHES FOR ELECTRIC MOTORS. J. G. Stirk. December 28th. (June 28th, 1915.)

1915.

270. ELECTRIC METERS FOR REGISTERING EXCESS. A. W. Burke. January 7th. (January 21st, 1914.)

324. ELECTRICAL TRANSMITTER MICROPHONES. B. H. Pilkington. January 8th.

353. CENTRIFUGAL COMPRESSORS. British Thomson-Houston Co. (General Electric Co., U.S.A.). January 8th.

482. SHADEHOLDERS AND THE LIKE FOR ELECTRIC LAMPS. J. N. Mollett and E. Mollett. January 12th.

1,091. DETECTORS, PARTICULARLY FOR WIRELESS SIGNALLING. Sterling Telephone & Electric Co., Ltd., and T. D. Ward-Miller. January 22nd.

2,546. ELECTRIC FIRES. H. H. Barry & W. J. Markham. February 17th.

4,911. ELECTRO-MAGNETIC SWITCHES. British Thomson-Houston Co. (General Electric Co., U.S.A.). March 30th.

7,869. RONTGEN TUBE APPARATUS. C. B. Burdon (Siemens & Halske Akt. Ges.). May 27th.

10,429. ELECTRIC TRANSMISSION SYSTEMS FOR MOTOR VEHICLES. N. Shuttleworth & Shackleton. July 1st.

11,3[illegible]. ELECTROLYTIC CURRENT MAGNIFIERS. W. Judd, A. Fraser, & Eastern Telegraph Co., Ltd. August 5th.